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An Illustrated Monthly Magazine, Devoted to the
Improvement of the Public Roads
and Streets.

VOLUME TWO,
JULY TO DECEMBER, 1892.

Published by the
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Potter Building, New York.

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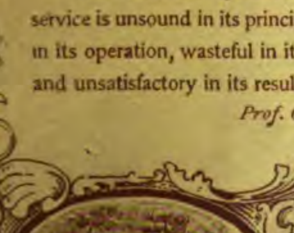

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GOOD ROADS.

Vol. 2. **July, 1892.** **No. 1.**

A TYPICAL CASE.

By Hon. Herbert W. Ladd, Governor of Rhode Island.

I AM a strong believer in good roads, and during my two terms in the Executive office have contributed what influence could be exerted in that direction to the cause. I believe thoroughly in the utility of well made and well kept highways and the value they have for every community and for all people of all pursuits. The people of Rhode Island have felt the influence of the modern reform movement in this direction, and within the past five years a great deal has been accomplished in this State.

GOVERNOR LADD.

While not designing to devote the brief communication I have been asked to write to the situation in this little corner of the land, I think the condition of things here is typical, much the same as may be found in perhaps every State in the Union, and consideration of it may therefore be instructive. Roads improvement in this State resolves itself into a solution of the problem of traffic and travel over our comparatively large areas of sparsely populated country. Our cities and most of our compact towns are in very good condition as regards roads. Indeed, Newport's splendid boulevards are of world-wide reputation. The main retail business street in Providence is often quoted as a model pavement highway, and in every direction well made macadamized roads extend to the city limits. Pawtucket's streets, made for the heavy traffic of a manufacturing city, are kept in good condition, and her main highways extending out from the town are broad and very well maintained. Woonsocket has recently made rapid strides in the direction of roads improvement, and her streets and suburban highways are being put in first-class shape. In South Kingstown, where the attractions of Narragansett Pier have brought wealth and population, there are miles and miles of broad, scientifically built and well cared for highways; and in other communities organized effort in the way of improvement societies, public spirit and money available from compact town population, have resulted in rapid and permanent road improvements.

When, however, we go abroad from the compact communities and into the "country," where good roads are most needed and poor roads are a direct tax on the pocket of every farmer who takes his truck to the nearest railroad station, his grain to the nearest mill, and his hay to town; whose livelihood is largely dependent on the work got from his horses and oxen and rolling stock; here we find bad roads and often an indifference to their costliness, born of ignorance, that discourages at the outset the would-be reformer. In area, this country section is the biggest part of the State. It is so in most States. Population therein is small and widely scattered. The first cost of constructing good roads is greater than the towns care to undertake, and in some of them would not seem to be warranted by the present demands of traffic. It is to be believed, however, that a good road is worth going in debt for, just as a good right-of-way is worth bonding a railroad for, to secure it; and doubtless many of the communities would find such a debt rapidly liquidated by the improvement in their condition either in an agricultural or industrial way or in the aspect of a "summer resort," which so many charming places in our State could assume did their highways furnish comfortable transportation or possibilities for pleasure-driving abroad.

A satisfactory condition of things cannot be reached, however, if an occasional enterprising town does undertake the reform. Its own work fails if adjacent towns do not co-operate with it in putting their roads into good shape. And the money question is certainly an important one in a town the area of which is, say, fifty square miles, while the population is less than 800, with much of the country hilly and the native soil almost unfit for permanent road bed. Yet not only does the growth and prosperity of just such a town most demand prompt redemption from its unfortunate condition, but an adjoining town with population and wealth may be a serious sufferer from lack of thoroughfare across the boundaries of its neighbor.

State roads, or at least county roads, would seem to offer a solution of the difficulty. A glance at the map of Rhode Island will show a splendid system of straight thoroughfare turnpikes that were laid in the stage coach days. Most of the older States have such a system, neglected, however, since the railroads came in. Put in repair and properly branched, these large arteries would drain most of the country to which I have referred, and benefit as well the State as a whole. In their original objects and in all their engineering features, these roads are distinctly "State roads." And I think it would be profitable for the State to redeem them or to establish a similar comprehensive system. The larger communities would thus bear the greater share of the burden of maintenance, as they would derive a proportionate share of the benefit—the prosperity of all the many smaller communities directly contributing to the prosperity of the larger.

The "good roads" movement, in its practical exemplification in most States, has been confined to local action. In Rhode Island we have no county government, but agitation for roads improvement has exerted a healthful influence, and the General Assembly of 1891–92 has endorsed the recommendation of the Executive for the appointment of a legislative road commission to examine into the existing condition of things and report thereon, together with suggestions which might be embodied into a uniform law or special acts of road legislation. There is a strong popular appreciation of what good roads mean, which has had a remarkable growth in the farming communities within the past few years; and I think the final solution of the problem will be found in a fundamental system of State roads, to which, it seems to me, popular sentiment is strongly tending.

LINES OF LEAST RESISTANCE.

By Edward J. Shriver, Secretary of the New York Metal Exchange.

NEXT to determining the need for a reform and the method for carrying it out, is the importance of intelligently deciding upon the best lines along which forces shall be set to work to accomplish the desired results. That good roads are needed, and sadly needed, in even the most advanced sections of our country, ought to be by now an accepted article of faith; and thanks to the educational agitation which is being so effectively carried on by such agencies as this magazine, it is rapidly becoming such. How to build them is more of an unknown art to many of us, but on this point, too, a wider and more thorough knowledge is fast being disseminated, and not least by the admirable technical papers to which these pages are so largely devoted. As to what machinery shall be employed for putting this knowledge to practical use has been less fully, or at least less definitely discussed; and it may be that the time is approaching when it may become necessary for those of us who are interested in this subject to more clearly formulate our ideas of how we can best work through the established political institutions of our country to attain the ends which we seek.

EDWARD J. SHRIVER.

The peculiar nature of these institutions, also, makes the necessity for such preparations all the more imperative. With the constant play of forces now tending to centralization of government, and again to the retaining of power and responsibility more closely in the hands of the individual citizen, the advantage seems at the moment to lie on the one side in some directions and on the other side in other directions. The old-fashioned theories which favored "state rights" have undoubtedly become greatly weakened, not only by the political changes of the past generation, but possibly even more by the influence of domestic commerce that, running to so great an extent across state lines, has contributed very materially to obliterate them from men's minds. The old-fashioned town meeting has lost much of its position as the most intimate political force in a considerable part of our Union, as population has grown too dense for the true neighborhood feeling to remain, and as local interests have come to identify themselves more closely with lines that radiate from railroad stations than with township lots; yet the sentimental pride of state citizenship, based as it so often has been on actual race differences that date back to the original settlement of the states, and the sentiment that centers about the old New England town, are neither of them by any means dead; and to supplement them, too, has grown up a spirit in favor of local self-government that manifests itself in a louder demand by the larger cities for home rule. When we glance at the economic lines of division in politics, we find more distinct evidence of the even balance between the socialistic and individualistic ideals which find their political parallel and usually their political affinity, in the schools which respectively contest for centralized and for local rule. On the one hand, the interference of government with ordinary business affairs has never been more sternly opposed than now, while on the other the disposition has unmistakably been growing to subject some kinds of corporate interests, if not all, to governmental regulation.

The study of those tendencies is not really so far apart from our subject as may appear at first glance, since before we can intelligently judge how far and how effectually public authority may be invoked to improve the public highways, we must feel the popular pulse to learn whether popular sentiment is likely to favor increased activity of social functions, to how great an extent and through what media it will most spontaneously operate. In the first named respect, we may firmly conclude, after examining current conditions, that the chances are even; since the forces working in different directions are so nearly balanced that there is not apt to be a decided general prejudice one way or the other. But in the fluctuation of opinion from one extreme to the other and through all the intermediate degrees, we find one American tradition as to the methods of government most positively persistent: that which distinctly marks out the lines by which are divided the fields of executive administration, according to whether it is of national, of State, or strictly local application. Our views as a people regarding the assignment of purely political power have been greatly modified in the latest generation of our history; but we still hold fast to the peculiarly American idea that each locality shall manage its own affairs as far as possible, and that such affairs as necessarily extend over a broader territory than the township or the city, should be extended to the administrative machinery of the several states unless it is absolutely impossible to confine them within state boundaries.

It is this principle, so strongly ingrafted in the American mind that it would seem hopeless, even if it were advisable, to attempt to dislodge it, that makes our road problem a very different one from that of European nations, and particularly of such nations as France and Germany. With them, centuries of intensely centralized government, organized on lines distinctly socialistic whatever may have been the political style of government, have habituated the people to accepting both initiative and constant direction from the central government, and even in England, where socialistic ideas have had so much less influence, the administration of the business side of government is concentrated to a degree that we can hardly appreciate, who have experienced openly our own system. Whatever we may think of the abstract wisdom of the two types, we must concede that no such central management could be effectively exercised over our tremendous expanse of territory as is exercised by the British Home Office over the domestic social business of the English people, or as reaches out its strong arm from Paris through each of the French departments. When our tourists come back from abroad and render us glowing accounts of the excellence of French roads, they do not always make it clear that these wonderful structures in remote districts do not so much represent a popular advance of intelligence on the subject, as they do the enlightenment of the comparatively few at the center of government; who, dealing with a territory sufficiently limited in extent for them to handle, have put into effect, and continue to maintain, their own ideas, irrespective of purely local demand.

We cannot do the same thing here, partly because the spirit of our institutions would not permit it, and partly because there are too many miles of road to be considered for any central office to treat them properly. Anything like a national scheme of legislation, fascinating as is the broader fields, must be abandoned as impossible to obtain and impracticable of really useful execution if it could be obtained; and it is even fair to say that this is true of schemes that look only to educative influence, the results of which, on a national scale, become so spread out as to become invisible. If proof were wanted of this, it could be found in the utter uselessness of the Department of Agriculture, and in the widespread discrediting of official architects and engineers, the latter particularly conspicuous during the past year.

The laws to promote the making and keeping of good roads can only be got from state legislatures, and it is their enactments, too, which only will ever produce any generally good results. Our real problem begins when we try to decide how much should be taken by the State into its own hands and how much left, as now, for its local subdivisions to administer; how far the desired laws should look to stimulative local sentiment only and how far to compulsory force. And in considering this, if we want to do more than make a show of doing something, we are bound to take into account the state of the popular mind; since it is a tolerably well established tenet that no laws are effective in a popular government that do not rest upon popular sentiment. In such matters as that which we have in mind especially, it does no good merely to put a law upon the statute book; we must put one there that is certain to be executed, or that, better still, will execute itself by virtue of hearty popular approval.

At the same time, it is perfectly true that, as the nation is too large, so is the township too small, to properly deal with the matter of road-building, however it may be as to road-maintenance. In one sense, the country road system is an ideal one ; the system that had produced such good results in New

Jersey. The county is not too large a unit to deal with the subject intelligently, as it is yet large enough in most cases to include the total mileage that is actually used by any given section, the inhabitants of which are, strictly speaking, the ones with the right to determine what kind of roads they shall have. Yet some friction may arise under this system; such has happened in Bergen County, New Jersey, where the county as a whole was for some time prevented from getting good roads by two townships which had already done their own road-building and did not want to contribute to a general fund. Moreover there are States of such large area that the competitive and educational influence of the more progressive counties is not felt by the backward ones, to spur the latter to follow their example. It is not the business of the State to force upon its citizens either good or bad things against their will, but it may be its proper function to put in their way the opportunity to see the advantage of improvements, and to aid the progressive minority in a generally backward section to get the benefits which are refused to them by the ignorance or inertia of their neighbors.

It is on this principle that the Richardson Bill, which has thus far failed to pass the New York Legislature, was advocated; its basis idea being to so extend a system of State roads as to enable every section to have a practical experience with proper public highways. Its weakest points are the extensiveness of the scheme with the suggestion of jobbery that such schemes are apt to carry; and beyond this, the indisputable fact that there is no use for State roads as such, roads being properly means of local transit only. If we accept the latter as an insuperable objection, or at least one impossible to overcome in the public mind, we are not quite shut out from the end sought to be attained. For so desirable a purpose it is quite permissible to extend State aid without making it compulsory to localities asking for them; and it is worth considering as a seductive bait to catch the granger vote that has proved the stumbling block at each of the sessions in which the Richardson Bill has been brought forward, whether it would not be well to explicitly limit such aid to localities in which either the population or the taxable valuation (or the amount of taxes collected) is under a specified figure; thus making it clearly a measure to benefit sparsely settled communities unable to advance funds themselves. The cost of the work could in this way be shown the protesting farmers to fall on themselves in much lighter proportion than the benefits; while each such locality in its turn would be thus tempted to take advantage of the plan, by the alluring prospect of getting something for nothing of which the gentle rustic is particularly so fond, without having it distinctly brought home that other localities are enjoying the same privilege. If we only had a rational system of State taxation, levied solely upon land values and exempting improvements entirely, not a word could be said justly against such aid; for as the value of adjacent land is inevitably enhanced by such public improvements—and that value only—the increase of taxable basis would always distinctly reimburse the State for such outlays; but even under our present complex system, this effect would be experienced in great measure, and in any event, the sections which would really foot the bill are not the ones from which opposition comes.

Some measure of compulsion might be superadded to advantage, through the indirect medium of local interests, rather than by exerting the direct fiat of the State. No matter how backward any county is, it nearly always has in its borders some township or city of a more progressive character than its environment; such subdivisions might be given the right to demand of the county authorities, under a judiciously drawn county road law, a given amount of road improvements on the highways leading out of the township or city into the adjacent country;* with a stipulation that the county should bear only a portion of the expense and have the option of assessing that portion upon abutting lands, according to the benefit that might be shown to accrue. This would again appeal strongly to local selfishness and would yet have the advantage of being palpably a fair arrangement; so that it is reasonable to believe that we would soon see short sections of good roads extending out into unenlightened neighborhoods, to which they would serve as valuable object lessons; and yet be developed along perfectly natural lines, rather than artificially forced ones. Such roads would moreover be much surer of proper maintenance than roads which might be built without any direct local demand for them. In all cases, it is clearly within the scope of the state to provide adequate directing ability, in the shape of such an engineering department as is included in the Richardson Bill; and some means of technical education might be utilized within the comparatively narrow limits of the State, where its efficiency would be altogether wasted if it were attempted to disseminate it from a national headquarters over the entire country.

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* This idea has already been applied by special laws, in certain localities.

The specific suggestions here made may not be the best ones for the purpose; but it is believed that the lines along which they run, being those of least resistance, must be followed with reasonable cleverness if we are to attain success in advancing beyond the propaganda stage of our agitation. Two things are absolutely certain: that we must consult human nature and its readiness to be led where it cannot be driven, its slowness to recognize profit of an improvement for which it sees that it must pay its share, and its readiness to grasp a thing which it imagines some one else is paying for; and that we further recognize the fixity of our local political institutions and methods and not try to run counter to these. We cannot map out a system of good roads, to be built and maintained by the superior intelligence that we expect to find at great administrative centers, as would be done abroad. We must concede that our people have been trained to consider a matter of local concern; that a general system of management would not be accepted by the people, nor could it be properly carried out over our great distances. We must reconcile ourselves to the idea that we cannot look to national legislation for any general help, and that even within State lines we must guard carefully against local jealousy and treat the State's function in the matter as an advisory one only, or at most as that of an arbiter between conflicting local interests, to whom is still remitted the actual control of such work.

THE ROADS OF DUNFERMLINE, SCOTLAND.

By James D. Reid, U. S. Commercial Agent.

ADAM SMITH, who was a citizen of this consular district, and whose great work on the Wealth of Nations has, perhaps, more than any other cause, influenced commercial legislation both in this country and in other lands, used no uncertain language on the value of public roads as one of the primary necessities of civilized life and national prosperity. Splendid roads had been constructed centuries before his time. Their continued existence fifteen hundred years after their construction proved the skill and care of the master minds who planned and built them. But they were constructed in the interest of war. Roads had to be built to move armies for conquest. Roads then became essential to hold the conquered countries. In these commerce had no element or consideration. Indeed it is not difficult to see that public roadways became thus the terror of nations. Even in this ocean-surrounded island, far from imperial Rome, the roads of the Cæsars entered and so terrorized the public mind that it was not until long after the middle of the eighteenth century that turnpikes were first authorized, and were even then inaugurated against the vigorous protests and prejudices of the common people. It seems strange also to know that to the Carthagenians, a people living on the northern coast of "Darkest Africa," must be given the credit of first inaugurating the public road as the necessity of commerce.

Down to the middle of the eighteenth century the roads of Scotland were of the poorest character. Goods conveyed from place to place, where the distances were not great, were conveyed on horseback. Oatmeal, coals, turf, and even straw and hay were thus conveyed. That was the era of "cadgers." They supplied the country with salt, fish, eggs and poultry. For longer routes carts were used. Through this very region to go a distance of thirty-eight miles and return required fourteen days. It took fourteen days, in 1873, to go from here to London. Considering how old is the supposed civilization of this great country, one is surprised to read of one of its chief routes of travel as follows:

"I know not how to describe this infernal road. Let me most seriously caution all travelers who may accidentally propose to travel this terrible country to avoid it as they would the devil. I passed three carts broken down inside of eighteen miles of execrable memory."

This is stated to show that roadmaking even here is not an ancient science. The first turnpike roads in Scotland were constructed in 1760, and against the violent resistance and prejudices of the people, who regarded roads as aids to plunder. Except only the remains of the Roman road, the improved roads of this country are of comparatively recent origin, but are now constructed with the utmost care and maintained with scrupulous fidelity.

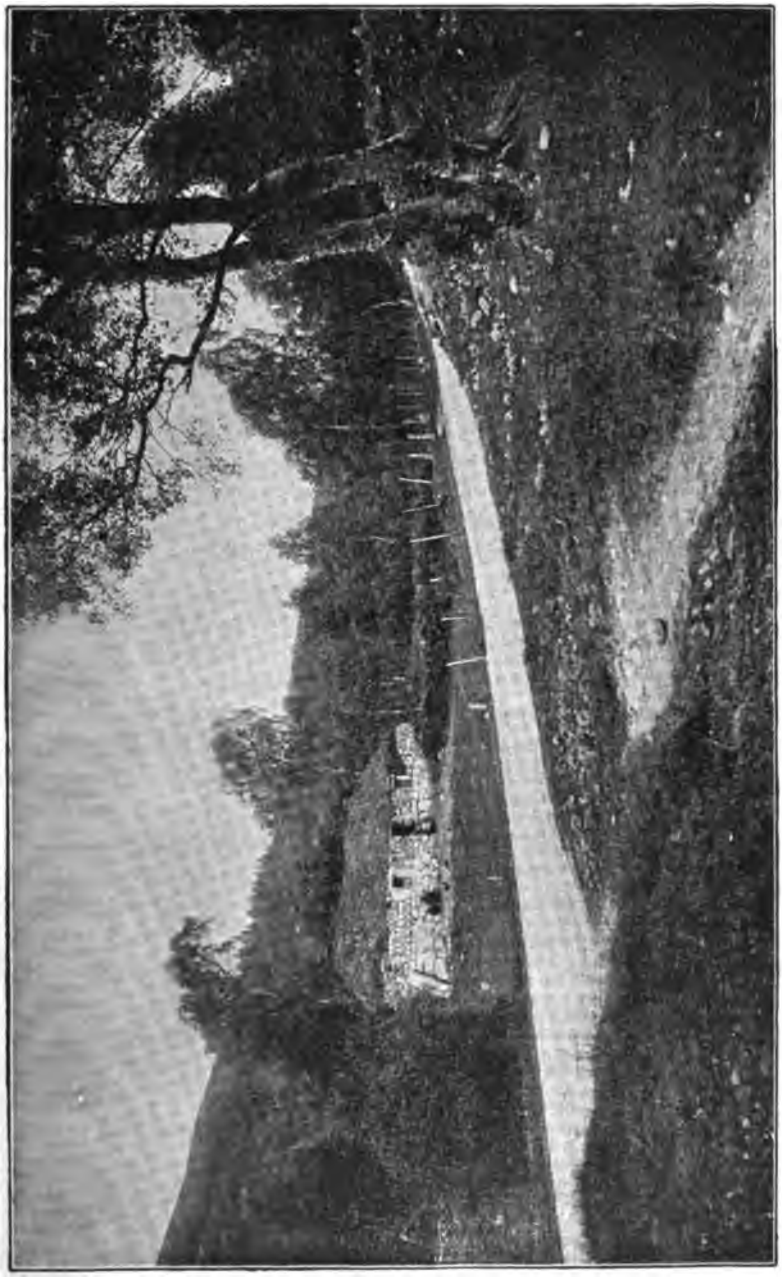
Roads in and beyond Fife.—The earliest stone roads built through and northward of this district were constructed by Abercromby, an engineer of some note, whose chief formula consisted of the following rules:

1. Never make a road ascend a single foot unless absolutely unavoidable.
2. Economy in maintenance depends on an easy gradient.
3. Hilly roads are full of danger, expensive to maintain, and destructive to horses.

The great Highland roads were constructed with great care and skill and were adapted to the country through which they passed. Although traversing wild mountain ranges, easy gradients were everywhere secured and are unexcelled.

The Macadam Road and the Steam Roller.—Two men of quite recent date were largely instrumental in the introduction of a general system, which is still maintained in its essential features. In 1819 Macadam elaborated his plan of roadmaking and presented it to the British Parliament. Upon its general plan a vast extension of the Macadam road immediately followed.

Perhaps the most important auxiliary to good roadmaking, and by many engineers deemed absolutely essential, was supplied by M. Polonceau in 1834, by the introduction of the steam roller. Excepting a very decided variance of opinion on the comparative advantages of soft and hard foundations, the



A COUNTRY ROAD IN SCOTLAND.

macadam road is the generally accepted road of the country for country roads, and has stood the test of long and varied experience.

Resistance to Traction.—A few years ago road making science expressed itself as follows as to traction:

1. Resistance is directly proportional to the load and inversely to the diameter of the wheel.

2. Upon a paved road the resistance is independent of the width of the tire when it exceeds three to four inches.

3. At a walking pace the resistance is the same to carriages with or without springs, but increases on the macadam roads with the velocity, and less as the road is smooth and the carriage less rigid.

4. On soft roads or freshly graveled roads the resistance to traction is independent of velocity.

5. The destruction of roads increases with reduced wheel diameter and in carriages without springs.

Gradients.—The steepest gradient, according to one authority, that can be properly allowed on roads with a broken-stone covering is about one in twenty, as this, from experience, according to the same authority, is found to be about the angle of repose upon roads of this character in the state in which they are usually kept. Engineers of eminence insist, however, and with apparent justice, on a much lower grade. Sir John Macneil asserts, as a fact not generally known, that "if a road has no greater inclinations than one in forty there is twenty per cent. less cost for maintenance than where the inclination of the road is one to twenty. The additional cost is due not only to the greater injury by the action of horses' feet on the steeper gradient, but also to the greater *fatigue* of the road by the more frequent necessity for sledging or braking the wheels in descent."

The same authority adds: "Experience teaches that on broken-stone roads in perfect condition the resistance to traction is of the gross weight or forty-five pounds per ton, for which the angle of repose is fifty. The traction force required is just double that which is required on a level."

Foundations.—Mr. Macadam maintained that a soft and yielding foundation for a road is better than one that is firm and unyielding. He argued that a road on a soft foundation being more yielding and elastic, the materials of which the covering of the road was formed would be less likely to be crushed and worn away by the passage of a heavy traffic than on a hard solid.

This theory of road foundation is still held by some, but rejected by the majority. Experience seems to have proved that there is no more general cause of bad roads than soft foundations. A firm, solid and dry substratum is necessary for the road materials to rest upon. The outer surface of the road, it is urged, should be regarded merely as a covering to protect the actual working road beneath, which should be sufficiently firm and substantial to support the whole of the traffic to be carried over it. The lower, or subroad, properly provided for, and the upper covering renewed from time to time, should last forever. The following are directions now generally in force:

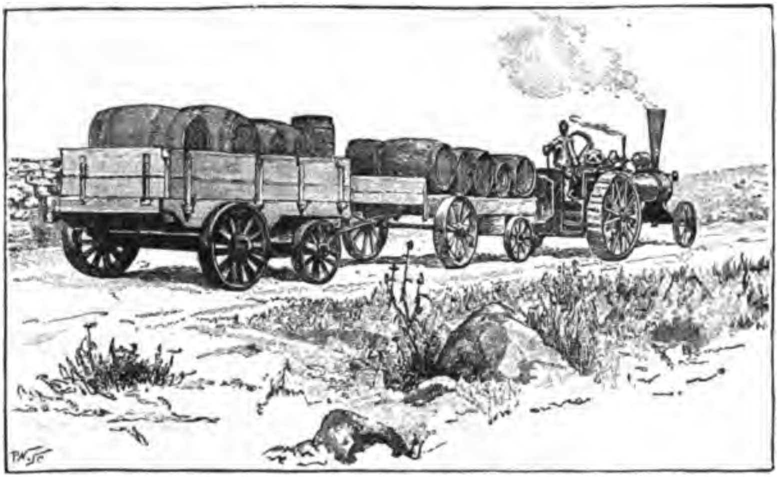
Where the expenditure is limited and the traffic moderate every care should be taken to make the roadbed as solid as possible. If the ground is wet, deep ditches should be cut on each side, and cross underdrains should be formed.

Where the ground is very soft a layer of faggots or brushwood from four to six inches thick should be laid over the surface of the ground to receive the road materials. Where the ground has been recently deposited the surface should be rolled or beaten to render as solid as possible.

Macadam's theory of the advantage of soft foundations, especially when made to apply to roads likely to bear a heavy traffic, seem now very generally discarded.

The Macadam Theory.—In 1816 Macadam put in practice his system of roadmaking, which is eminently worthy of restatement in this inquiry. His principle was "to put broken stone upon a road which shall unite by its own angles so as to form a solid, hard surface. When this material is thus laid upon the road it must remain in the situation in which it is placed without ever being moved again, whereas gravel, before it becomes useful, must move its situation and be in constant motion." The principle was "to substitute small angular stones, such as resulted from the breakage of larger stones, for rounded stones, so as to form a sort of mosaic or interlocking system."

This system, which experience has thoroughly tested and



HAULING SCOTCH WHISKEY ON COUNTRY ROADS IN SCOTLAND.

approved; the provision of solid foundations, which seems to be proved of the first importance; and the use of the steam roller in securing thorough impact, are the three vital elements of the successful modern road.

On these three principles of road building the following roads have been extended within a comparatively short period:

	Length of road. *Miles.*	Area. *Sq. Miles.*	Population.
Great Britain	160,000	122,519	30,621,431
France	100,048	210,460	38,192,064
Prussia	55,818	139,675	23,970,641
Spain	10,886	198,061	15,673,481

Convexity of Roads.—Macadam gave the following testimony before a committee of the House of Commons, and which is practically the judgment of the most experienced road-builders:

"I consider that a road should be as flat as possible with regard to the water flowing off, because a carriage ought always to stand upright. I have generally made roads three inches higher in the center than at the sides, and on this slope the water will easily escape. When the road is made flat people will not follow the middle of it as they do when extremely convex. More water will stand on a very convex road than on a flat, because all carriages seek an upright position in the center, and the wear there will, of course, be greater. The most useful inclination is in the direction of a road's length, and engineers give preference to a moderately inclined road over one rigidly level. To secure an equal distribution of service every part of a road should be equally hard and good to prevent unequal wear."

Highways in the Dunfermline District.—I am indebted for much of what follows to personal interviews with and documents furnished to me by John Maclennan, Esq., for some years president of the Association of Road Surveyors for Scotland.

1. *Road Routes.*—Other things being equal a road route should be chosen having the freest exposure to sun and wind.

2. *Gradients.*—Gradients should not exceed one in forty. Easy gradients are preferable to dead levels, securing drier and more compact roads.

3. *Foundations.*—All roads should have foundations to be determined by the character of the soil on which they are laid. On roads of moderate travel, the soil light and the natural or unstoned road, well compacted, unbroken and of easy gradient, the necessity for special foundations is absent, and, according to Macadam, unnecessary. Wherever, however, the surface is broken either to elevate or depress, the ground should be well rolled or tamped. Where the soil is soft and yielding or an active traffic is likely, the foundations become important. Stones laid on their flattest side and compacted with broken metal, ashes, or the like, require to be carefully laid. Even cement, in which gravel forms a useful constituent, becomes essential if the nature of the soil is yielding and the traffic heavy. New macadam roads are now generally made with a foundation from six to twelve inches of stone shivers, slag, brick rubbish, or other inferior character, on which six inches of hard metal is laid.

4. *Drains.*—In forming road foundations the proper provision of drains is important. These, whether by side ditches or by lateral or transverse carefully constructed drains, are essential to a good and economical maintenance of a road under the best conditions. Existing conditions will determine their character and mode of structure.

5. *Character of Stone.*—The stones employed on Scotch roads are of the hardest and toughest obtainable. In these the granites are by far the most serviceable, and that because of their unstratified character. Granite, named so from its coarse, granular

structure, has for its prevailing elements a crystalline compound of three simple minerals—feldspar, silica or quartz, and mica—silica varying in proportion from sixty-five to eighty per cent. and usually in an amorphous condition, cementing the feldspar and mica. Granite is capable of absorbing ten pounds of water per cubic yard=1.450 of its weight. Perhaps the most valuable stone for macadamizing roads is the Welch stone, greywacké of Penmaenaur, in Wales, which, while of the same weight as granite, is much harder and is so highly esteemed that enormous quantities are sent by ship and rail to the large towns in the north of England, Scotland and Ireland. This shows the value of hardness in the metal for public roads. The following table may be of interest:

Stone.	Specific gravity.	Crushing resistance per square inch.	Weight of water absorbed in 48 hours.
Graywacké	2.75	7.54	1 part in 1641.
Granite, Scotch	2.67	5.74	1 part in 490.
Sandstone, English	2.41	4.38	1 part in 47.

Of Scotch granites Guernsey is the most durable. The most important quality in stone for roadmaking is toughness. Mere hardness without toughness is of no use, as such stone becomes rapidly reduced to powder by the action of wheels. The sandstones and the limestones are to be avoided because of their affinity for water, by which in frosty weather, which has been preceded by wet, they are split up into powder and the solidity of the road is destroyed.

6. *Breaking the Stone.*—The quality of stone proper for the metaling of the road is scarcely more important than its preparation. It should be reduced to angular fragments of such a size that each piece will pass freely through a ring of two and one-half inches in diameter in every direction. Broken stone is superior to gravel, and, wherever obtainable, should always be employed. Pebbles, when cleaned, never bind until they become ground and worn down and are incapable of supporting the pressure of heavy wheels. If gravel be employed, experience seems to indicate that it is best to leave some binding material to adhere in order to secure firmness and cohesion.

There has been introduced into the service of the roads in this district a stone-breaking machine with good effect and economical results. The comparative cost of breaking stone by machine and hand labor is as 1s. per ton for the former against 2s. 3d. per ton for hand labor. In a trial of the two systems

3,325 cubic yards of stone broken by machine cost £169 18s. 7d., while the same quantity broken by hand cost £398 4s.

7. *Metaling the Road.*—The foundation of the road having been carefully provided, and which, as has been stated, can be done either for roads of moderate travel by thoroughly drying and solidifying the soil by tamping or rolling, or, as recommended by able engineers for roads of larger travel, of using soft stones or cinders, the stones being "carefully set by hand, broad end down, in the form of a close, neat pavement," there shall then be placed six inches of broken stone to such width as may be desired, but so laid that the entire width shall form a convex line or segment of a flat ellipsis, the arch of which shall not exceed six inches in thirty feet. This shape not only assists the water to pass from the center toward the sides, but contributes to the drying of the road by allowing the action of the sun and air to produce a great degree of evaporation. The use of the steam roller in at once compacting and smoothing the road, it is believed, is becoming more and more acceptable, and producing, both in construction and repairs, very useful results.

8. *Road Repair.*—The following quotation from a report of Government Surveyor Maclennan is pertinent and complete:

"The chief end of road repair is a smooth, hard and slightly elastic surface. To secure this the metal should be of uniform size and quality. Small two-inch whinstone metal is, in my opinion, the best. Large metal, although ever so well binded and rolled, will in a very short time present an uneven surface, not having the same capacity for forming into the concrete as when smaller. Hard and soft stones should not be mixed. The soft stones are quickly ground into mud, while the hard protrudes, rendering the surface rough and uneven. When the surface is very sorely worn I apply a small sprinkling of clay to give a bed for the new material. Work of this kind requires experience and care. I believe in giving good convexity to the road. Water should run off quickly to avoid great waste and damage. After distributing metal a stone roller of one ton weight is used to secure a fair surface. In the matter of 'binding' I am convinced that where the subsoil is retentive and the surrounding ground wet, spongy, and of a clay nature, the less binding the better for the road. A smooth and beautiful surface may be quickly secured, but the deterioration is equally rapid. The men appointed for surface repair have much to do with the road's success and should be selected with great care."

9. *Foot Roads.*—The provision of foot-paths is important, but seems not generally provided for. When made, the refuse of the road and gravel are used.

10. *Depots.*—On all important roads depots of stone occupying a small space, more or less frequently, along the margin of the road, are provided, where the stone is broken, generally by hand, and kept ready for use.

11. *Effect on Property Valuation.*—To this inquiry the prompt reply was: "Roads are the life and necessity and hope of all Scottish industries, and their value increases rather than diminishes with railroad extension. Property would without them be comparatively valueless."

BILL NYE ON WAGON ROADS.

OUR wagon roads throughout the country are generally a disgrace to civilization, and before we undertake to supply Jaeger underwear and sealskin covered Bibles with flexible backs to the African, it might be well to put a few dollars into the relief of galled and broken down horses that have lost their health on our miserable highways.

The country system, as I recall it, was in my boyhood about as poor and inefficient as it could well be. Each township was divided up into road districts, and each road district was presided over by an overseer of highways, whose duty it is to collect so many day's work or so many dollars from each taxpayer in the district. Of course, no taxpayer would pay a dollar when he could come and make mud pies on their road all day and visit and gossip with the neighbors and save his dollar, too.

The result seemed to be that the work done was misdirected and generally an injury to the road. With all due respect to the farmer, I will state right here that he does not know how to make roads. An all wise Providence never intended that he should know. The professional roadbuilder, with the money used by the ignorant sapheads and self-made road architects, would in a few years make roads in the United States over which two or three times the present sized load could be easily drawn, and the dumb beasts of the republic would rise up and call us blessed for doing it.

A SUGGESTION OF VALUE.

By Hon. T. Guilford Smith, Regent of the University of the State of New York.

The following letter has been received by the League National Committee on Improvement of the Highways.

To the Committee on Improvement of Highways, League of American Wheelmen.

Gentlemen: Now that the literature in reference to the state of the common roads of the country has been so widely circulated by your organization, it seems to me as though it were timely to take up the consideration of how to apply the remedy. I believe it is well understood that there is money enough spent every year on the common roads of the state to put them in good condition and keep them so if the money were only wisely spent. The question then arises how to so instruct the supervisors, pathmasters and other officials who have charge of the common roads as to the method of maintaining the roads and spending this money. I therefore venture to make the following suggestions in reference to the instruction of these parties.

At the various technical schools in New York State, such as the Troy Polytechnic, Columbia College, Cornell University and others, courses are given each year (and are part of the regular curriculum) as to the construction, maintenance and repair of common roads. It seems to me that without very much expense, and with very little difficulty, these courses might be thoroughly advertised, so that the attention of the various supervisors and others in the immediate vicinity of these colleges might be called to this fact, and that they might thus be enabled to take advantage of these courses of instruction. not simply going to hear the lectures, but entering regularly as students in this special course. If this were general, there is no reason why they should not attain the same proficiency as the students in civil engineering, who listen to the same instructions. It seems to me that a communication to these various colleges from your Committee on Highway Improvement could not fail to receive proper consideration, and perhaps the various schools would permit outside students to take this special course, paying therefor a certain specified sum, which should simply embrace the tickets for this course of lectures and the instructions thereunder.

There is no good reason, also, it appears to me, why Summer schools on this subject should not be established at the same institutions of learning, and thus the facilities for instruction, the buildings, etc., be made use of during the Summer vacation while the regular courses of study are interrupted for the Summer, provided, of course, that a sufficient number of students to attend these Summer schools could be obtained.

In my opinion, this might be made particularly available at Chautauqua, and road making and road caring might be made special subjects of study at the Chautauqua University.

I can readily see that objection might be made to both of these plans, because the time of year suggested is the busiest season for the farmers generally, and it might be impossible for them to attend these schools during the Summer. To meet this objection, I venture to suggest to your Committee that application be made to the University Extension Committee of the Board of Regents of the University of the State of New York, to establish local schools for instruction in these subjects at any points in the State of New York where a sufficient number of paying students can be obtained to warrant the establishment of a course of lectures, with instruction and examinations. I would particularly emphasize the importance of not making any of these lectures free, and also the importance of having examinations after the lectures, to see what proficiency has been attained by those who attend them. With these two safeguards, it seems to me that the money would not be wasted, and that many local centers would be established, where there were a sufficient number of students desiring them, and willing to pay for the instructions. Of course the terms for this tuition would have to be made low, which is a question of detail to be established, either by your Committee itself, or after consultation with the University Extension Committee of the Board of Regents.

If University Extension has the vitality which we all believe, and is the result of a demand which we all feel exists, there seems to me no more important subject to be taught than the building and caretaking of the great highways of the State. Such courses of instruction cannot fail to be popular and do very much to justify the University Extension movement in the rural districts.

T. GUILFORD SMITH.

THE DEVELOPMENT OF AN IDEA.

By Francis B. Thurber, of New York.

"WHY didn't somebody think of it before?" is always the exclamation whenever a highly useful and necessary thing for everybody is suggested by somebody; and this is what I feel like saying when I think of the enormous amount that has been wasted in the way of money, time and effort in this country, by every citizen, in overcoming the difficulties presented by bad roads; and why somebody has not thought of a concerted study of the subject and a concerted discussion of it before is a puzzling question.

A good road enables the farmer to drive to town twice as quickly and with half the effort that is required on a bad one, and it enables his team to haul twice or perhaps thrice the load that can be hauled over the ordinary dirt road in seasons of inclement weather.

This difference between a good and bad road may even mean to him the difference between life and death for his loved ones in the fetching of a doctor, or it may simply mean the difference between profit and loss in the operation of his farm; for by the use of good roads, as experience has demonstrated wherever good roads have been used, a farm can be operated profitably twice as far from the town or railway station as it otherwise could be.

To the merchant, good roads mean the ability to trade over a wider area of country, the exemption from the dull periods so often experienced on account of "bad roads," a more economical operation of his business in the receipt and delivery of his goods, and an additional sense of comfort, which every one experiences in driving over a road which is free from mud and stones. The same considerations, to a greater or less degree, affect the physician, the clergyman, the lawyer, and indeed every citizen who has reason to use the common roads, or whose business or welfare is in any way connected with or dependent upon their use; for good roads are important, and in many cases absolutely necessary to the poorer people who have to walk, and to whom it is an important consideration to be able to go to church, to the post office or to the village store, without wading through mud or dust. In the same sense it is true for the school children, especially those in the country, who are often compelled to walk long distances to attend the public schools.

I was born and brought up as a farmer's boy, and during my life in the country have helped to work the roads in Spring, and know how they are kept in order, or rather not kept in order, in most of the country districts.

I have studied this question somewhat, and do not hesitate to state my opinion that our bad roads are largely due to the system generally pursued in working them, namely, the voluntary day's work or "labor tax" system, and I do not think we shall ever have a business-like demonstration of highway laws until the road tax is paid into the general treasury and expended on a business system, requiring the work to be done under sealed bids and according to specifications drawn by experts, not omitting the requirements of responsible bondsmen to secure the due carrying out of the contracts. By this system, carried on under the eye of an enlightened public, the commissioner of roads, or other public officer having the work in charge, would be stimulated to hold contractors up to an honest performance of their duties.

Road contracts should be let for a term of years to secure the best work at the lowest prices, for no contractor can afford to put permanent and economical work on a road, or to expend his money in the purchase of labor-saving machinery, unless he can be assured of a contract sufficiently long in point of time to enable him to reap some benefit.

The keeping of a road in order is as important as putting it in order. In no other work does the old adage, "A stitch in time saves nine," apply more exactly than in the care of roads. Keeping the drains and gutters clear during the season of heavy rains, keeping the stones thrown out which are always coming loose in the ordinary country road beds, keeping the wheel tracks filled and rounded so as to prevent the settling of water and the forming of mud holes in the worn depressions, are little things which require constant attention, but they are important and necessary in the maintenance, on a comfortable basis, of the average country road.

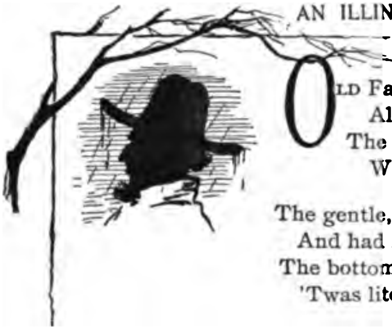
I am speaking now of the average country road, because I feel that the most important problem is first to raise the standard of these roads before we can arrive at the more perfect condition presented by the use of macadamized roads such as are most likely to be built near the larger cities and towns. The construction of high class roads, however, form an important object lesson which will gradually extend itself to a wider area and impress even the farmers with the economic value of a hard, smooth roadway, so that it is safe to say that the educational work now being done will result, within a few years, in the maintaining of a higher standard of roads in this country than has ever been before enjoyed. No more important work can be undertaken, for there is none that is so widespread in its benefits, alike to the high and low, the rich and poor.

BURDETTE ON THE DRUMMER.

"He looks over my shoulder as I register after him, and hands me a card with a shout of recognition; he peeps over the register again and watches the clerk assign me to ninety-three. 'Ninety nothing!' he shouts. 'Who's in fifteen?' The clerk says he is saving fifteen for Judge Dryasdust. 'Well, he be blowed,' says my cheery friend. 'Give him the attic and put this gentleman in fifteen.' And, if the clerk hesitates, he seizes the pen and gives me fifteen himself, and then calls the porter and orders him to carry up my baggage and put a fire in fifteen, and in the same breath adds: 'What time will you be down to supper, Mr. Burdette?' and he waits for me; and seeing that I am a stranger in the town, he sees that I am cared for; that the waiters do not neglect me; he tells me about the town, the people and the business; he is breezy, sociable, full of good stories, always good-natured, he frisks with cigars, and overflows with 1,000-mile tickets; he knows all the best rooms at the hotel; he always has a key for the car seats, and turns a seat for himself and friends without troubling the brakeman; but he will ride on the woodbox or stand outside to accommodate a lady, and he will give up his seat to an old man. I know him pretty well. For three years I have been traveling with him, and I have seen the worst, and I know the best far outweighs the worst. I could hardly go along without him. I am glad he is so numerous.

THEY MAY BE SINKING YET.

AN ILLINOIS SYMPHONY.



OLD Farmer John drove off to town
All on a rainy day.
The glistening highway, up and down,
With mire shown all the way.

The gentle, weeping raindrops fell
And had fall'n all the night;
The bottom of that highway—well,
'Twas literally " out of sight."

But John had hitched his sturdy steeds,
His sturdy steeds and true,
That often 'mid such urgent needs
Had boldly struggled through.

And John had sworn a big, round oath,
With deep and bated breath,
He'd rather brave the deep, forsooth,
Thrice o'er than starve to death.

"A big, round oath"

For visions of the flour bin,
'Twas empty, he could see,
And for a week no sugar in
His coffee cup had he.

No Sugar.

And so amid the sea of mire,
  Those steeds right valiant reel,
While turbid waves creep higher, higher,
  Upon the wagon wheel.

Oh, help, ye powers that rule the wave,
  Wherever ye may be;
Reach down and this poor mortal save
  From out that turbid sea.

They sink; now just the horses' ears
  Still struggling through the flood;
Now nothing but John's hat appears
  Above that sea of mud.

The rich, black loam of Illinois
  Above that outfit met;
And, since our roads are bottomless,
  They may be sinking yet.

DIRT ROADS AND GRAVEL ROADS.

By Isaac B. Potter.

V.

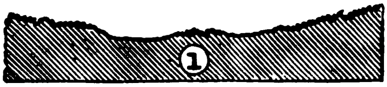
(*Concluded.*)

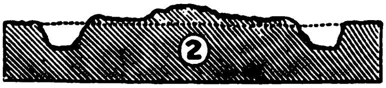
BESIDES the "New Era" grader, the F. C. Austin Manufacturing Company manufactures a steel reversible road machine which seems to have given excellent satisfaction wherever used. Its inventors claim special advantages for this machine in the making and repairing of country roads, the most prominent of which is an arrangement which enables the blade to describe a complete circle, to be set at any angle and to work either inside or outside of the front wheels, as may be desired. In the widening of roads, cutting down of banks and cleaning out of ditches, this wide variation of blade adjustment is of peculiar value, and it also enables the road maker to increase or to decrease the draft required to manipulate the machine.

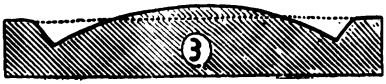
Another road machine of excellent merit is the "American Champion," made by the American Road Machine Company, of Kennett Square, Pa. This machine is also reversible and is so made as to be manipulated with great ease and efficiency. Both the Austin machine and the "American Champion" have been on the market for some years and are highly recommended by road commissioners and town officers who are familiar with their use.

A new road grader has just been put upon the market by the firm of Montgomery Ward & Co., of Chicago, and in point of first cost it is probably the cheapest machine in the market. Its makers claim for this machine that it is equal to the best in respect to practical results, and although this claim has yet to be verified by the test of time, it must be said that this machine comes into the market fully guaranteed by its makers, a house of the highest business repute and of undoubted commercial standing.

To show you the superior work due to the use of road machines in the making and repairing of dirt roads, I have introduced here three rough diagrams which illustrate a contrast with considerable force. Fig. 1 shows a cross section of the ordinary "unworked" country road, in which the wheels of passing vehicles have worn down the roadway, forming two shallow ditches, which catch and hold the water and thus insure the softening of the surface and the forming of "mud holes." Fig. 2 shows a rough diagram, in which may be seen the ordinary form of cross section of a dirt road in the country after the dirt has been shoveled out from the side ditches and roughly thrown into the middle of the road. Fig. 3 is a rough diagram, showing an approximate cross section of earth roadway formed by a road machine, in which the dirt at the two angles has been cut out by sharp steel blades and thrown up into the centre of the roadway; it is rounded and graded by the passing of the machine. I should say to you, however, that the rounded surface in this figure (3) is largely exaggerated, and that a more correct and more satisfactory form of cross section requires a uniform slope from the centre of the road to the side, instead of a rounded surface as here shown. You may find this correct form of cross section more exactly shown on pages 194 and 195 (Chapter III.)







The rapidly increasing use of road machines prompts me to include here for your benefit a few points taken from the printed circulars of one of our leading road machine companies, regarding the value and method of operation of the road machine.

SUGGESTIONS TO OPERATORS AND POINTS TO BE CONSIDERED IN SELECTING A ROAD MACHINE.

To the fair-minded, intelligent road official of the present day, there is no question as to the many advantages of road machinery over any other method of repairing dirt roads.

Besides doing the work at less than half the cost, vastly better results are obtained. The difference between the results obtained by the use of a road machine and the old-fashioned plough and shovel method is clearly defined. A road machine, of recognized merit, will plough an even ditch of uniform depth, and will plough where an ordinary plough will not enter the soil. The scraping blade of the machine moves the earth from the ditch to the middle of the road, distributing it evenly and leaving the road-bed smooth, without any of those little bumps and holes which characterize a road repaired in the old-fashioned manner. These bumps and holes, small at first, will wear larger, and soon develop into good-sized ruts, making the road very unpleasant to travel over.

It is conceded that a good reversible machine will do the work of from thirty to forty men in the ordinary work of road construction, thus effecting a saving of more than one-half over the old methods.

Suggestions to Operators.—In the work of operating a road machine, as in everything else, experience is the best teacher, but our machines are so simply constructed that any man, with ordinary intelligence, after he has acquainted himself with the different adjustments, will, with a very little practice, be able to operate the machine well under all circumstances. A slow, strong motion is indispensable to good work.

Repairing.—A little timely work done in the right way is like "the stitch in time that saves nine." No matter how nicely and well a road has been made, travel, rain and frost all combine to destroy it.

There is hardly a month in the year when the road machine cannot be used to advantage in the road, but Spring is the best time to do efficient work, because the soil is loose and roots of grass and weeds do not interfere. Every Spring, before the ground becomes too hard, the road should be gone over thoroughly with the road machine; the ditches cleaned out, so that water may have a free outlet; ruts and holes filled, elevations in the road and the shoulders on the side of the road planed off, the grade improved and the road put in a good condition generally. In repairing a road which is in fair condition, commence at the ditch and work towards the centre, scraping lightly with the entire length of the blade, till the last rounds in the middle of the road, when the rear end of the blade is carried high enough to allow the earth to distribute under it.

To make the blade penetrate very hard, stony ground, it may be best to use only the point, elevating the rear end considerably. The best finish can be obtained in sod ground by first cutting the sod as thin as possible, then placing them in the middle of the road, and finally going back to the ditch and bringing up earth and leveling over the sods. Ruts or depressions that are too deep to be filled with the machine, should be filled in with gravel. Do not fill in more than is necessary, only sufficient to fill the holes.

How to Build New Roads.—In building new roads with a machine, first mark out your ditches the full width, ploughing a light furrow with the point of the blade, carrying the rear end well elevated. On the second round, drive the wheels in line with the point along the hollow made the first round, ploughing a full furrow with the advance end of the blade, dropping the rear end somewhat lower than before. The third time round move over towards the middle of the road the earth previously ploughed. Then return to the ditch and plough it out deeper, moving the earth over towards the middle whenever as much earth is ploughed as the machine can move at once. Repeat this until the ditches are the proper depth, and the road as full and round as required; then surface off as directed in repairing.

Points to be Considered in Selecting a Road Machine.—In the selection of a road machine, the following points should be carefully considered:

1. Thoroughness and simplicity of its mechanical construction. 2. Material and workmanship used in its construction. 3 Ease of operation. 4. Lightness of draft. 5. Adaptability for doing general road work, ditching, etc. 6. Safety to the operator.

In the use of road machines you will find the old saying, "The best is the cheapest," to be exemplified in a most emphatic degree. Unless used in soft soils you will require four horses or more to draw your machine, and frequent contact with hard soils and stony materials will result in severe strains upon your road machine, which should, therefore, be made substantial and of the best materials. Moreover, it should be so made as to be easily handled so that an expert will not be required to use it. Keep the wearing parts properly oiled and give the machine the same attention and care that you would bestow upon any piece of machinery employed in your personal business. This being done, a good "all round" road machine will repay its value a hundred times over and will do the work of forty men in a clean, regular and systematic way.

I have given you the names of several responsible manufacturers, merely to guide you in beginning your investigation of the road machine subject, and without in any way intending to recommend one machine above another, for, while I have my individual preference, I am aware that men of large experience, and excellent judgment, do not always agree on these points; and the fact that each of these machines has its strongest partisans among people who know it the best, is abundant proof that they are all *good*, and that you will commit no serious error in the selection of any one of them.

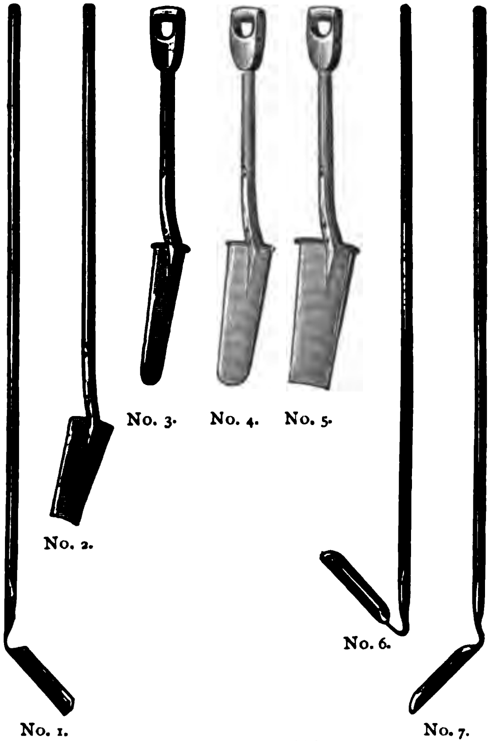
VI.

CARTS—DRAINING TOOLS—LAYING PIPE CULVERTS AND CROSS DRAINS—LAYING TILES—ROLLING—THE WEIGHT OF ROLLERS—WAGON TIRES.

Carts.—Always in the construction of a new road, and very often in the repair of old ones, it becomes necessary to haul earth or other material from one point of your work to another. The ploughing, grading and handling of earth in excavation and embankment generally require much of the work to be done on a soft surface where wheeling is more or less difficult and the hauling of large loads generally impossible. In such cases the ordinary four-wheeled farm wagon, with narrow wheel tires, cannot be profitably used, and if the amount of work to be done will justify the investment, you had better employ the

DUMP CART FOR HAULING EARTH.

light two-wheeled carts, such as are commonly used by railroad contractors in handling earthwork. These carts are generally supplied with wide tires, and each cart being drawn by one horse, is so balanced that the load is evenly divided above the axle, while the general form of the cart makes it easy to handle and enables the laborers to load and unload it with great facility. An ordinary shoveler will load into a cart one-third of a cubic yard of heavy soil in about seven minutes. If the material is loam the same work will be done in about six minutes; if sandy soil, about five minutes. This is about the ordinary cart load as hauled in actual work.


No. 3.
No. 4.
No. 5.
No. 2.
No. 6.
No. 1.
No. 7.

DRAINING TOOLS.

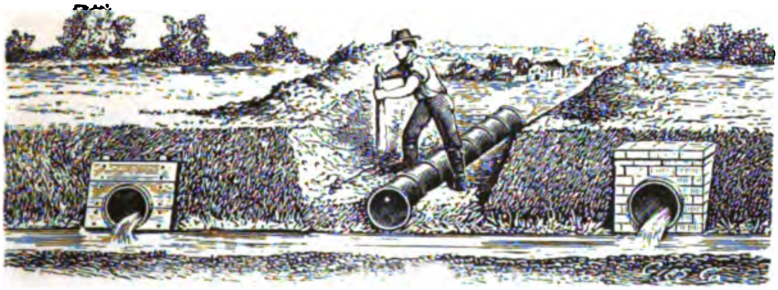
Draining Tools.—At times nothing is more needed in a road maker's outfit than a good set of draining tools, and some of those in most common use I have shown in the annexed illustration, in which the separate implements are numbered from

1 to 7 inclusive. Besides being handier to use than the ordinary spades, hoes and shovels used by the farmer in his every-day work, these tools will be found to hasten the completion of your work by avoiding unnecessary excavation and give to the whole job a complete and workmanlike finish. In using these tools you will find the spades numbered 3, 4 and 5 to be most useful in digging the ordinary drain ditch, while Nos. 6 and 7 will be found useful and convenient for cleaning out and rounding the bottom of the ditch to receive round tile. No. 6, on account of its peculiar form, is sometimes called a "tile hoe." No. 2, by reason of its long handle and special form of blade, is useful in shoveling out loose dirt and leveling the bottom of the ditch, while No. 1 is used for the same purpose, in cases where the ditch is designed to contain "sole" tile.

Laying Pipe Culverts.—If you take a dozen lengths of vitrified pipe and lay them on level ground, fitting the pieces end to end so that the plain end of each pipe will fit into the socket end of the next, thus forming a continuous line of open pipe, the work will appear exceedingly simple, and you will readily understand the method of fitting these pipes together in the construction of a cross drain or pipe culvert. There are other considerations, however, which are vastly more important than the novice would suppose, and these must be kept in mind; for although the work is simple, it must be intelligently executed and each step must be followed with a view to strength and permanency of your pipe culvert.

First of all you must have a trench. Begin at the lower or down stream end, if possible, and give your trench at this point such a depth that the outlet of the pipe will be above the pool into which the water will flow. The grade or "fall" of your trench need not be more than one inch for each ten feet if carefully laid, although double this "fall" will insure better work, a quicker flow and a cleaner interior of your pipe, which will be "scoured" by the quicker passage of water if the grade is moderately abrupt; but whatever the grade, it should, when once adopted, be adhered to as closely as your skill will permit.

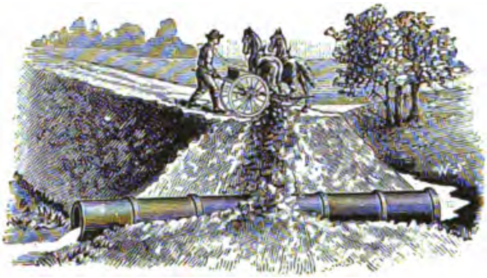
The next thing to be considered is the importance of having a firm bearing for all sides of your pipe. To aid you in securing this result, you had better give the bottom of your trench a rounded form corresponding with the outer circumference of the pipe as closely as possible, and then, throughout the length of the trench, cut slight depressions across the bottom into which the sockets or collars of the pipe will fit. This is necessary in order to prevent the pipe from resting on the sockets. If the ground is of a sandy or shifting nature it may not be possible to cut out these depressions, and in such cases you may lay your pipe to grade throughout the length of the drain and then ram the loose earth or sand round and beneath the lower surface of each pipe and up to its horizontal centre line. As each length of pipe is laid, this work of giving it a secure and uniform bed throughout its entire length should be carefully attended to, for you may be sure that when this is done the pipe will be capable of sustaining any reasonable pressure which may be thrust upon it from above, and that no amount of earth-filling loaded upon its upper surface will be sufficient to break it.



VIEW SHOWING METHOD OF LAYING PIPE CULVERTS.

If abutments are used at the ends of your pipe culverts, of course these must be set on suitable foundations, and deep enough to resist the action of frost if practicable. Stone or brick abutments are greatly to be preferred, but in situations where expense must be closely looked after, a post may be securely driven into the ground on each side of the pipe, at each end of the culvert, and planks cut to fit around the pipe and firmly spiked to the upright pieces. Where the length of drain or culvert does not exceed the width of the ordinary roadway, it will be better, if abutments are used, to build these abutments up to heights of the bottom of the pipe at the inlet and outlet ends, and this being done, the grade can be easily followed from one abutment to the other.

In some places, where the bank is not subjected to the destroying effects of floods and swiftly flowing streams, the pipe may be carefully laid as I have directed, without the use of abutments, though the omissions should be supplied, as far as possible, by the compacting of stone around the ends of the pipe where they protrude from the embankment. Your good judgment will prompt you as to the best way of doing this in any particular locality.



VIEW SHOWING PROCESS OF FILLING EARTH BANK OVER PIPE CROSS DRAIN. NO ABUTMENTS.

(*To be continued.*)

SPECIFICATIONS*

FOR LAYING AN ASPHALT PAVEMENT, ON CONCRETE FOUNDATION.

1. *Work and Materials Must Agree with Specifications.*—All the materials furnished, and all the work done, which in the opinion of the City Engineer shall not be in accordance with these specifications, shall be immediately removed, and other materials furnished, and work done that will, in the opinion of said engineer, be in accordance therewith. Before any materials are placed upon the street or avenue, the engineer shall approve of the quality and finish of samples of the same which shall be furnished at his office.

2. *Inspectors on Sub-divisions of Work.*—The work under this agreement is to be prosecuted at and from as many different points in such part or parts of the street or avenue on the line of the work as the said engineer may from time to time determine, and at each of said points inspectors may be placed on the day designated for the commencement of the work thereat. Whenever any work is in progress at or from one or more points at a time, an inspector may be designated by said engineer to supervise each sub-division of the same, whether such sub-division be the excavation for and preparation of the foundation, or the laying of the pavement, or the laying of the crossing stones, or otherwise.

3. *Right to Construct Sewers, Etc., Prior to Laying of Pavement.*—The right to construct any sewer or sewers, or receiving basins and culverts, or to build up or adjust any manholes, or to reset or renew any frames and heads for sewer manholes, or for city water or gas stopcocks, or to lay gas or water pipes, or to construct necessary appurtenances in connection therewith in said street, or to grant permits for house connections with sewers or with water or gas pipes, at any time prior to the laying of the new pavement over the line of the same, is expressly reserved by the Board of Road Commissioners; and said commissioners reserve the right of suspending the work on said pavement on any part of the line of said street or avenue at any time during the construction of the same, for the purposes above stated,

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*As adopted by the city authorities of Waterbury, Conn.

without other compensation to the contractor for such suspension than extending the time for completing the work as much as it may, in the opinion of the said commissioners, have been delayed by such suspension; and said contractor shall not interfere with, or place any impediment in the way of any person or persons who may be engaged in the construction of such sewer or sewers, or in making connections therewith, or doing other work above specified, or in the construction of any receiving basins and culverts, or in setting or resetting any curb or gutter stones on the line of the street or avenue.

Contractor to Remove Incumbrances.—In case there shall be, at the time stipulated for the commencement of the work, any earth, rubbish, or other incumbrance on the line of the work, the same is to be removed at the expense of the contractor.

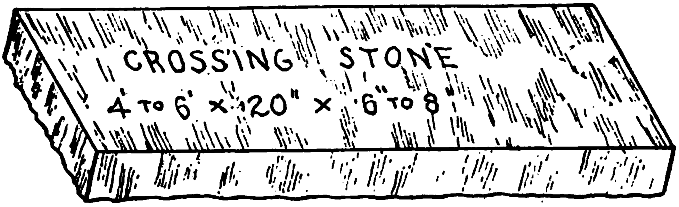

FIG. 1, SHOWING GENERAL FORM AND DIMENSIONS OF CROSSING STONE.

4. *Crossing Stones.*—When new crossing stones are required they are to be furnished in conformity with the following description, to wit:

The new crossing stones to be blue stone equal to the best quality of North River blue stone, free from seams and imperfections, or of granite approved by the engineer. Each stone to be not less than four nor more than six feet long, except in cases where specially permitted, and twenty inches wide, and of a uniform thickness, which may vary from six to eight inches, and dressed to a face on top not varying in evenness by more than one-fourth of an inch, and on the bottom bedded, with sides square and full, and ends cut to a bevel of six inches in two feet, and special cases to such other bevel as shall be directed by the engineer. The new stones to be in quality and workmanship acceptable to the engineer, and to be cut so as to lay to a joint not exceeding one-fourth of an inch from top to bottom on the ends, and one-half inch on the sides. Old crossing stones shall be relaid in accordance with the specifications for laying new crossing stones.

5. *Manhole Heads, Etc.*—All the frames and heads for sewer manholes, and for city water or gas stopcocks, on the line of the work, are to be reset or new ones set if required, on a level with the new pavement, by the city or the gas company. The sewer manholes, if below the grade, will be built up to the proper height by the city.

6. *Curb and Gutter Stones.*—The curb stones along the line of the work, the pavement in the intersections that may be retained, and the pavements and crossing stones adjoining, and also the gutters of the adjoining pavements as far as may be necessary to obtain proper drainage, shall be readjusted and brought to the grade and lines of the proposed pavement as required, without extra charge therefor, except for curb stones, as specified below. The gutter stones, which shall become the property of the contractor, to be taken up and the pavement extended to the curb stones. Whenever any curb stones are required the contractor shall furnish them of stone equal in quality to those required by the city for new curb stones. For resetting old curb as required by the engineer six cents per linear foot will be paid by the city, and for furnishing and setting new curb forty-six cents.

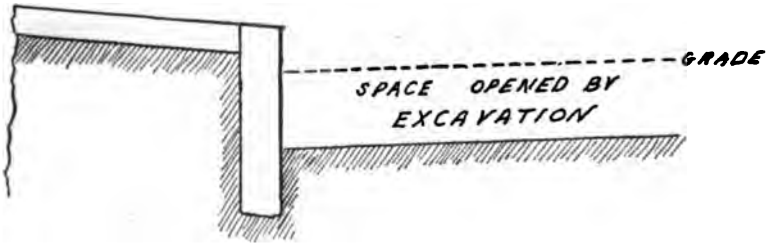

FIG. 2, SHOWING PARTIAL SECTION OF STREET AFTER EXCAVATION.

7. *Preparation of Foundation, Etc.*—All paving and other stones necessary to be removed shall be taken up and immediately removed from the line of the work; *the subsoil or other matter (be it earth, rock, or other material) shall then be excavated and removed by the contractor to the depth of eight and one-half inches for refined asphalt pavement and eight inches for natural rock asphalt pavement, below the top line of the proposed asphalt pavement. Should there be any spongy material or vegetable matter in the bed thus prepared, all such*

material shall be removed, and the space filled with clean gravel or sand carefully rammed, so as to make such filling compact and solid, and the entire roadbed thoroughly rolled with a heavy roller. Should any filling be necessary to lay the pavement at the required grade, the contractor shall supply the same without any extra compensation therefor; said filling to be composed of good sand or gravel and placed upon the roadbed, thoroughly rammed or rolled, as the engineer shall direct, at any point, in layers of not more than six inches in depth, thoroughly compacted. Upon the foundation thus prepared shall be laid a bed of hydraulic cement concrete, six inches in thickness, to be made as follows:

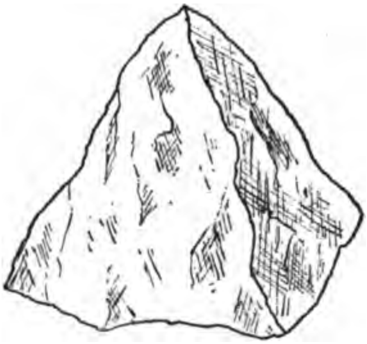

FIG. 3, SHOWING LARGEST SIZE STONE ALLOWED IN CONCRETE MIXTURE.

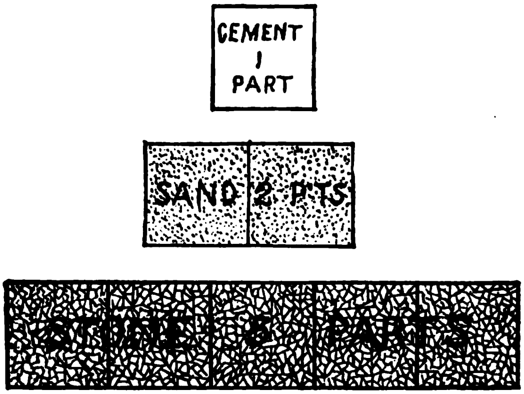

FIG. 4, DIAGRAM SHOWING RELATIVE QUANTITIES FOR PORTLAND CEMENT CONCRETE.

Cement.—All cement must be of the best quality of either fresh-ground Portland or Rosendale hydraulic cement, and shall be tested and approved by the engineer before being used.

Stone.—The broken stone shall be solid trap or equally hard stone, free from dust or dirt, and of a size not larger in any dimension than will pass through a two-inch ring, and shall be crushed and screened before being brought upon the work, and no crushing or screening shall be done on the work.

Concrete.—Concrete, when Portland cement is used, shall be composed of one part of cement, two parts of clean, sharp sand, and five parts of broken stone, by measure.

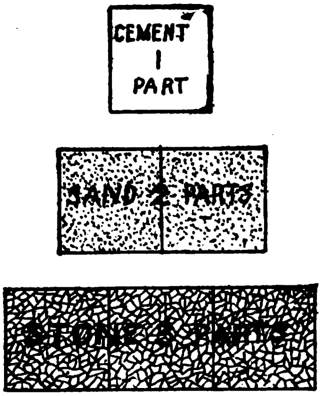

FIG. 5, DIAGRAM SHOWING RELATIVE QUANTITIES FOR ROSENDALE CEMENT CONCRETE.

Concrete, when Rosendale cement is used, shall be composed of one part of cement, two parts of clean, sharp sand, and three parts of broken stone, by measure. The cement and sand shall be mixed dry, then water added in only sufficient quantity to form a mortar; the broken stone having been first wet, shall be then added and the mass turned over and worked until the broken stone is covered completely with the mortar.

The concrete shall be placed in proper position and there rammed with wooden rammers until thoroughly compacted and has a clear mortar surface, which surface shall be two and one-half inches for refined asphalt pavement and two inches for natural rock asphalt pavement, below the grade of the top of the finished pavement and exactly parallel thereto.

The concrete foundation shall be capable of sustaining such test as the engineer shall deem necessary.

No carting or wheeling will be allowed on the concrete until sufficiently set, and then only on planks laid down for the purpose.

The whole operation of mixing and laying each batch must be performed as expeditiously as possible, by the employment of a sufficient number of skilled men, and, if necessary, must be protected from the action of the sun and wind until set. No concrete shall be used which shall be found to be weak or imperfect, either from standing too long after being mixed, or from any other cause.

8. *Wearing Surface.*—Upon this foundation, when sufficiently dry, must be laid the wearing surface, or paving proper, the basis of which, or paving cement, must be pure asphaltum, unmixed with any of the products of coal tar.

The wearing surface must be composed of

(*a*) 1. Refined asphaltum.
2. Heavy petroleum oil.
3. Fine sharp sand, clean and free from loam.
4. Fine powder of carbonate of lime.

The asphaltum must be specially refined and brought to a uniform standard of purity and gravity such as renders it best adapted for paving purposes.

The heavy petroleum oil must be freed from all impurities and brought to a specific gravity best suited for paving purposes.

From the ingredients above mentioned shall be prepared the best pavement mixture that the skill and experience of the present day can produce. The proportions shall be such as will give a smooth but not slippery surface, and a wearing surface that will not grow soft in Summer nor crack in Winter.

The pavement mixture prepared in the manner thus indicated must be brought to the ground in carts, at a temperature of about 250 degrees Fahrenheit, and if the temperature of the air is less than 50 degrees, iron carts, with heating apparatus, shall be used in order to maintain the proper temperature of the mixture; it shall then be carefully spread, by means of hot iron rakes, in such manner as to give a uniform and regular grade, and to such depth that after having received its ultimate compression it will have a thickness of 2½ inches. The surface shall then be compressed by hand rollers, after which a small amount of hydraulic cement shall be swept over it, and it shall then be thoroughly compressed by a steam roller weighing not less than 250 pounds to the inch run, the rolling to be continued for not less than five hours for every 1,000 yards of surface.

In order to make the gutters, which are consolidated but little by traffic, entirely impervious to water, a width of twelve inches next the curb must be coated with hot pure asphalt and smoothed with hot smoothing irons in order to saturate the pavement to a certain depth with an excess of asphalt.

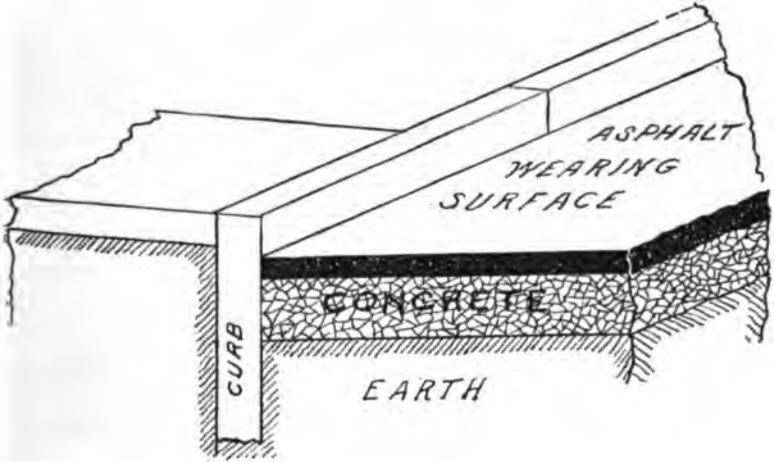

FIG. 6, SHOWING PARTIAL VIEW AND SECTION OF COMPLETED ROADWAY.

(*b*) If rock asphalt be used, it shall be a natural bituminous rock equal in quality (1) to that mined by the Compagnie General des Asphaltes de France from the French mines at Seyssel, or (2) that mined by the United Limmer and Vorwohle Rock Asphalt Company, Limited, from the Sicilian mines at Ragusa and the German mines at Vorwohle, or (3) to that mined by the Neuchatel Asphalte Company, Limited, from the Swiss mines at Val de Travers; and it shall be prepared and laid as follows:

(1) The lumps of rock shall be finely crushed and pulverized. Nothing whatever shall be added to or taken from the powder obtained by grinding the bituminous rock. The powder shall contain 9 to 12 per cent. natural bitumen. (2) This powder shall be heated in a suitable apparatus to 160 or 200 degrees Fahrenheit, and must be brought to the ground at such temperature, in carts made for the purpose, and then carefully spread on the foundation previously prepared to such depth that, after having received its ultimate compression, it will have a thickness of two inches. (3) It shall be skillfully compressed by heated rammers and rolled until it shall have the required

thickness of two inches. (4) The surface to be rendered perfectly even by heated smoothers and to be rolled with a roller weighing not less than 250 pounds to the inch run, the rolling to continue not less than five hours for every 1,000 yards of surface.

9. *Paving Between Street Car Tracks, Around Manholes, Etc.*—Between the rails of the street car track shall be laid granite paving blocks of a quality acceptable to the engineer. The blocks shall be laid on a bed of clean sand two inches in thickness. The blocks shall measure from 3½ to 4½ inches in width, from 6 to 7 inches in depth, and from 8 to 12 inches in length. They shall be laid in rows across the line of the track with close joints, breaking joints at least two inches with each other. They shall be laid by skilled pavers.

After being laid in position they shall be rammed to place with a rammer weighing not less than forty-five pounds. The joints shall then be equalized in width with a pinchbar, half filled with fine screened gravel or coarse sand, dry and hot, and immediately run full of prepared paving pitch boiling hot.

Outside the rails shall be laid in a longitudinal course of granite paving blocks or a line of granite curbing, rammed and joints filled as specified for the space between the tracks. Granite paving blocks shall also be laid around manhole heads, water gate boxes, and gas stopcocks where directed by the engineer.

10. *Laying the Crosswalks, Etc.*—The crosswalks adjoining the new pavement are to be laid, or the present crossing stones shall be relaid, as the said engineer may direct, in which last case they shall be dressed or redressed so as to form one-quarter of an inch joints from top to bottom when laid. All the new crossing stones, and such of the present crossing stones as may be retained, are to be well and firmly bedded on a foundation of sand or gravel, not less than four inches in thickness, and laid with joints not exceeding one-quarter of an inch in width from top to bottom on the ends. The courses to be so laid that the transverse joints must be broken by a lap of at least one foot. The pavements adjoining, and also the gutters of the adjoining pavements, as far as in the opinion of said engineer may be necessary to obtain proper drainage, must be taken up, brought to the grade of the new pavement and relaid, without extra charge therefor. The contractor shall lay two rows of paving blocks between the courses of crossing stone when directed so to do by the engineer.

A FAMOUS GHOST STORY.*

(*Continued.*)

We did not stay long in the drawing-rooms—in fact, they felt so damp and so chilly that I was glad to get to the fire upstairs. We locked the doors of the drawing-rooms—a precaution which, I should observe, we had taken with all the rooms we had searched below. The bedroom my servant had selected for me was the best on the floor—a large one, with two windows fronting the street. The four-posted bed, which took up no inconsiderable space, was opposite to the fire, which burned clear and bright; a door in the wall to the left, between the bed and the window, communicated with the room which my servant appropriated to himself. This last was a small room with a sofa-bed, and had no communication with the landing place—no other door but that which conducted to the bedroom I was to occupy. On either side of my fireplace was a cupboard, without locks, flush with the wall, and covered with the same dull brown paper. We examined these cupboards—only hooks to suspend female dresses—nothing else; we sounded the walls—evidently solid—the outer walls of the building. Having finished the survey of these apartments, warmed myself a few moments, and lighted my cigar, I then, still accompanied by F——, went forth to complete my reconnoitre. In the landing place there was

"THE DOOR, WHICH NEITHER OF US WAS TOUCHING, OPENED QUIETLY."

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* "The House and the Brain." By Edward George Bulwer: Lord Lytton.

another door, it was closed firmly. "Sir," said my servant, in surprise, "I unlocked this door with all the others when I first came; it cannot have got locked from the inside, for——"

Before he had finished his sentence, the door, which neither of us then was touching, opened quietly of itself. We looked at each other an instant. The same thought seized both—some human agency might be detected here. I rushed in first, my servant followed. A small, blank, dreary room without furniture—a few empty boxes and hampers in a corner—a small window—the shutters closed—not even a fire-place—no other door but that by which we had entered—no carpet on the floor, and the floor seemed very old, uneven, wormeaten, mended here and there, as was shown by the whiter patches on the wood; but no living being, and no visible place in which a living being could have hidden. As we stood gazing around, the door by which we had entered closed as quietly as it had before opened; we were imprisoned.

For the first time I felt a creep of indefinable horror. Not so my servant. "Why, they don't think to trap us, sir; I could break that trumpery door with a kick of my foot."

"Try first if it will open to your hand," said I, shaking off the vague apprehension that had seized me, "while I unclose the shutters and see what is without."

I unbarred the shutters—the window looked on the little back yard I have before described; there was no ledge without—nothing to break the sheer descent of the wall. No man getting out of that window would have found any footing till he had fallen on the stones below.

F——, meanwhile, was vainly attempting to open the door. He now turned round to me, and asked my permission to use force. And I should here state, in justice to the servant, that, far from evincing any superstitious terrors, his nerve,

"F——, MEANWHILE, WAS VAINLY ATTEMPTING TO OPEN THE DOOR."

composure, and even gayety amid circumstances so extraordinary, compelled my admiration, and made me congratulate myself on having secured a companion in every way fitted to the occasion. I willingly gave him the permission he required. But though he was a remarkably strong man, his force was as idle as his milder efforts; the door did not even shake to his stoutest kick. Breathless and panting, he desisted. I then tried the door myself, equally in vain. As I ceased from the effort, again that creep of horror came over me; but this time it was more cold and stubborn. I felt as if some strange and ghastly exhalation were rising up from the chinks of that rugged floor, and filling the atmosphere with a venomous influence hostile to human life. The door now very slowly and quietly opened as if of its own accord. We precipitated ourselves into the landing place. We both saw a large, pale light—as large as the human figure, but shapeless and unsubstantial—move before us, and ascend the stairs that led from the landing into the attics. I followed the light, and my servant followed me. It entered, to the right of the landing, a small garret, of which the door stood open. I entered in the same instant. The light then collapsed into a small globule, exceedingly brilliant and vivid; rested a moment on a bed in the corner, quivered and vanished. We approached the bed and examined it—a half-tester, such as is commonly found in attics devoted to servants. On the drawers that stood near it was perceived an old, faded silk kerchief, with the needle still left in a rent half repaired. The kerchief was covered with dust; probably it had belonged to the old woman who had last died in that house, and this might have been her sleeping room. I had sufficient curiosity to open the drawers; there were a few odds and ends of female dress, and two letters tied round with a narrow ribbon of faded yellow. I took the liberty to possess myself of the letters. We found nothing else in the room worth noticing—nor did the light reappear; but we distinctly heard, as we turned to go, a pattering footfall on the floor—just before us. We went through the other attics (in all four), the footfall still preceding us. Nothing to be seen—nothing but the footfall heard. I had the letters in my hand; just as I was descending the stairs I distinctly felt my wrist seized, and a faint, soft effort made to draw the letters from my clasp. I only held them the more tightly, and the effort ceased.

We regained the bedchamber appropriated to myself, and I then remarked that my dog had not followed us when we had left it. He was thrusting himself close to the fire, and trembling. I was impatient to examine the letters; and while I read them, my servant opened a little box in which he had deposited the weapons I had ordered him to bring; took them out, placed them on the table close to my bed-head, and then occupied himself in soothing the dog, who, however, seemed to heed him very little.

"I DISTINCTLY FELT MY WRIST SEIZED."

The letters were short—they were dated; the dates exactly thirty-five years ago. They were evidently from a lover to his mistress, or a husband to some young wife. Not only the terms of expression, but a distinct reference to a former voyage, indicated the writer to have been a seafarer. The spelling and handwriting were those of a man imperfectly educated, but still the language itself was forcible. In the expressions of endearment there was a kind of rough, wild love; but here and there were dark unintelligible hints of some secret not of love—some secret that seemed of crime. "We ought to love each other," was one of the sentences I remember, "for how every one else would execrate us if all was known." Again: "Don't let any one be in the same room with you at night—you talk in your sleep." And again: "What's done can't be undone; and I tell you there is nothing against us unless the dead could come to life." Here there was underlined in a better handwriting (a female's), "They do!" At the end of the letter latest in date the same female hand had written these words: "Lost at sea the 4th of June, the same day as——"

I put down the letters, and began to muse over their contents.

Fearing, however, that the train of thoughts into which I fell might unsteady my nerves, I fully determined to keep my mind in a fit state to cope with whatever of marvellous the advancing night might bring forth. I roused myself—laid the letters on the table—stirred up the fire, which was still bright and cheering—and opened my volume of Macaulay. I read quietly enough until about half-past eleven. I then threw myself dressed upon the bed, and told my servant he might retire to his own room, but must keep himself awake. I bade him leave open the door between the two rooms. Thus alone, I kept two candles burning on the table by my bed-head. I placed my watch beside the weapons, and calmly resumed my Macaulay. Opposite to me the fire burned clear; and on the hearth-rug, seemingly asleep, lay the dog. In about twenty minutes I felt an exceedingly cold air pass by my cheek, like a sudden draught. I fancied a door to my right, communicating with the landing place, must have got open; but no—it was closed. I then turned my glance to my left and saw the flame of the candles violently swayed as by a wind. At the same moment the watch beside the revolver softly slid from the table—softly, softly—no visible hand —it was gone. I sprang up, seizing the revolver with one hand, the dagger with the other. I was not willing that my weapons should share the fate of the watch. Thus armed I looked round the floor—no sign of the watch. Three slow, loud, distinct knocks were now heard at the bed-head; my servant called out, "Is that you, sir?"

"I SPRANG UP, SEIZING THE REVOLVER."

"No; be on your guard."

The dog now roused himself and sat on his haunches, his ears moving quickly backward and forward. He kept his eyes fixed on me with a look so strange that he concentrated all attention on himself. Slowly he rose up, all his hair bristling, and stood perfectly rigid, and with the same wild stare. I had no time, however, to examine the dog. Presently my servant emerged from his room; and if ever I saw horror in the human face, it was then. I should not have recognized him had we met in the street, so altered was his every lineament. He passed by me quickly, saying in a whisper that seemed scarcely to come from his lips, "Run—run! it is after me!" He gained the door to the landing, pulled it open, and rushed forth. I followed him into the landing involuntarily, calling to him to stop; but, without heeding me, he bounded down the stairs, clinging to the balusters, and taking several steps at a time. I heard, where I stood, the street door open—heard it again clap to. I was left alone in the haunted house.

"I SAW HORROR IN THE HUMAN FACE."

It was but for a moment that I remained undecided whether or not to follow my servant; pride and curiosity alike forbade so dastardly a flight. I reentered my room, closing the door after me, and proceeded cautiously into the interior chamber. I encountered nothing to justify my servant's terror. I again carefully examined the walls, to see if there were any concealed door. I could find no trace of one—not even a seam in the dull-brown paper with which the room was hung. How, then, had the *thing*, whatever it was, which had so scared him, obtained ingress except through my own chamber?

(*To be continued.*)

THE EDITORS TABLE

THE second volume of GOOD ROADS begins with this number. It is a fit occasion to address a few words to the friends of the magazine and to the advocates of the cause we are striving to advance. GOOD ROADS is your magazine; founded to help the movement in which you have embarked, and devoted to the advancement of principles in which you believe. It aims to accomplish two things: first, by the force of its precepts, to encourage and instruct the people in the construction and maintenance of better highways; and, second, the attainment of substantial pecuniary profit such as will warrant the publication and free distribution of pamphlets, and the delivery of free lectures in all parts of the Union where this kind of instruction will be graciously received.

These two objects can hardly be dissociated in an enterprise of this character, but it is the second, the pecuniary side of the question, to which attention is now directed. In the management of every publication a substantial source of income is the advertising. The advertisers in GOOD ROADS are friends of the movement, and almost without exception have manifested a warm interest in the success of the magazine. They are men of character and good business repute, and to the end of the chapter it will be our effort to exclude all undeserving persons from our advertising pages. Now, to every one of our 60,000 readers, we send this word of advice: Patronize our advertisers. Tell them the reason. We all must buy at one time or another, and when we buy an article let us buy one that is advertised in GOOD ROADS, and let it be understood that we are pursuing this policy with conscientious strictness. None of us will lose by it, and the cause will be an immense gainer. If it is understood that the 60,000 readers of this magazine are a trifle clannish in their disposition to support it, and that they will excercise their partisanship in favor of the advertisers whose money helps to sustain it, then will the advertising pages of GOOD ROADS be enlarged and extended, the profits will increase and multiply, the strength and influence of the Bureau be doubled and this work extended into every county and town within the United States.

WE are gratified by many pleasing assurances that GOOD ROADS has improved in quality and appearance since the issuing of the first number. Many excellent suggestions have been received from our readers; some have been acted upon and others held for such time as the prevailing conditions shall seem to favor them. In the construction of the new volume we shall try and merit the continued approval of our readers and to give to GOOD ROADS that practical and readable quality that will make it useful and interesting in every home circle where it may be received.

THE Minnesota Divison of the League has made the pioneer effort in a direction from which success must eventually come in the roads improvement movement, and to which the energies of all friends of good roads should quickly tend. At the recent National Republican Convention at Minneapolis, Chief Consul Choate presented the subject squarely and tersely to the committee on platform, and suggested that there be included in the committee report a declaration in favor of better roads and revised road laws throughout the country. The profound and dignified statesmen who had the matter in charge were full of "sympathy" with the roads improvement scheme; but their mouths were full of ready and specious reasons why the roads question should not be specially referred to in the platform. To make it short, the matter of better roads was left in the background, and the G. O. P., without attempting to do anything in behalf of the country roads, will go on shouting "tariff" till next November, and then suddenly wake up to the fact that impassable roads on election day mean the practical disfranchisement of 200,000 farmers and the not improbable defeat of the Republican candidates.

At the Chicago Convention the subject of better roads, although not expressly mentioned, must have been impressed upon the minds of that great congregation of the "unterrified." One of our facetious Republican friends has made the remark that since their ancestors were drowned with Pharaoh in the Red Sea, the Democratic statesmen at Chicago had never heard of so much water as fell on the leaky roof of their convention barn during the Chicago powwow. Outside, they waded and wandered through the wonderful depths of Cook County mud, and indoors their eloquence was moistened and clarified by the showers which trickled through the sprinkling-pot that somebody had put overhead to answer the purposes of a roof. Even while we write these delegates are finding their painful way out of Illinois mire and for the next ten days will struggle back to their several and widely separated homes where, by a liberal turning on of the hose, they will readjust their personal toilets and get ready to talk about the tariff.

Meanwhile, all honor to Chief Consul Choate and his Division for the practical good they have done in forcing this question upon the attention of the Minneapolis committee. The time is at hand when the agitators for good roads will combine in a demand that this question, which is far and away the most important question of the day, shall be made an issue in the public elections.

THE prominent agricultural papers, almost without exception, are giving place to a discussion of the roads improvement subject, and many of their farmer readers are ventilating their ideas on the subjects of an improved method and better laws. The chief difficulty which they seem to encounter is an opposition to any scheme which requires a general State tax for the purpose of improving the main roads. It ought to be very easy for our farmers to understand that under the present arrangement they are paying almost the entire expense, in labor and money, for the doing of an immense amount of work which has never been well done and sometimes too often absolutely neglected. In some of our States, notably in our older States, a system of State roads would not only impose upon the farmers a tax so small that it could hardly be felt, but more than seventy per cent. of the cost of making and maintenance of the State roads would fall upon the incorporated cities and villages. To farmers who doubt the policy of inviting such a scheme into action, we would suggest the propriety of examining the public tax-rolls and informing themselves of the thousands of millions tied up in city and village property which bears none of the burden of maintaining the public highways. A little information on this point is always useful and sometimes invigorating.

THE prize essay contest inaugurated by the Pope Manufacturing Company some months ago, and for the encouragement of which that company offered 100 bicycles as prizes for the best written articles on good roads, seems to have awakened an interest among the youth of the country, not only in the contest itself, but in the subject to which the essays were directed. Excellent essays have been received from about every State in the Union, and some of these productions show both careful study of the subject and a skillful selection of useful and interesting matter relating to it. When it is remembered that the result of this contest is not only to stimulate an interest among the competitors themselves, but also among thousands of schoolmates and parents who have been looking forward to the award of these prizes, the beneficent result of this excellently devised contest may be better appreciated.

THE official programme of the Scranton meet, issued by the Pennsylvania State Division, is a marvel of good taste and convenience and a treasure of information to every wheelman of that State. It is combined with the Division Handbook in a neat little volume of about eighty pages, and is made in form convenient for the pocket, while the large amount of valuable information it contains is conveniently arranged and easily referred to under the separate topics treated.

NEWS AND COMMENT

"The Royal Blue Line" (Baltimore & Ohio Railroad) has recently sent a train humming over the steel track between New York and Washington, which for some time maintained a speed of one mile in less than forty seconds—a rate that leaves the "pneumatic" still out of the question. The Company is advertising a half rate to wheelmen for the round trip to Washington and return for the grand July meet at the Capital city, and Chairman Mott, of the National Transportation Committee, has declared this road to be the official road for L. A. W. members who propose to attend the Washington meet. The agents of the B. & O. are making special arrangements for the comfort and accommodation of wheelmen going through from our larger cities, and it is hoped and believed that wheelmen going to Washington will avail themselves of the superior advantages thus offered.

The St. Paul *Daily News* of June 20 states that "the absolutely frightful condition of the roads precludes the possibility that a great deal of business will be done until the season is over," and demands that a State convention should be held to devise a method for the improvement of the Minnesota roads.

The Chicago *News Record* prints the following item, which embodies a painfully emphatic argument in favor of better roads:

In the case of Frederick Peck, who was tipped out of his buggy and killed on 40th street, the coroner's jury has declared that his death was chargeable to the wretched condition of the road. When a man cannot drive over a highway in the second city of the land without risking his life it is evident that the agitation for better roads deserves serious attention.

The Chicago Farm Implement and Vehicle Club has introduced the roads improvement subject into its regular monthly discussions, and on the evening of June 3 the question "What can we do to secure the improvement of our country roads" was the sole topic under consideration.

Mr. Albert Roux writes us from Paris, under date of June 3, correcting a statement recently made in our pages, and informing us that Stephan, the French wheelman who won the Bordeaux-Paris road race, covered the distance of 351 miles in 25 hours and 28 minutes or approximately 338 miles in 24 hours.

The chosen freeholders of Morris County, N. J., are actively agitating the question of bonding the county for about seventy miles of Telford roads. The improvement is sadly needed, and the property of Morris County as well as the business of its citizens would be largely benefitted by the improvement.

An important bill affecting the District of Columbia is Senate Bill No. 1307, introduced by Senator Faulkner, and now waiting its order of final passage. The bill provides for a permanent system of highways in that part of the District of Columbia lying outside cities. Its first section directs the commissioners of the District to "prepare a plan for the extension of a permanent system of highways over all that portion of said District not included within the cities of Washington and Georgetown." It also provides that the system shall be as nearly as practicable in conformity with the street plan of the City of Washington. None of the new highways shall be less than 90 nor more than 160 feet wide, except in the case of existing highways, which may, however, be widened in the discretion of the commissioners. Provision is also made for the condemnation of lands required for new highways and for necessary improvements.

The new Boulevard from the Kill von Kull, beyond the Guttenburg race track (N. J.), promises to be a good road if the corrupt politicians of Jersey City do not ruin it. It will cost a million and will be about fourteen miles long.

POPULAR OPINION

"ALLOW me to assure you of my high appreciation of GOOD ROADS. You are engaged in a good work in which all right minded people will heartily wish you great success."—*John M. Stahl, Editor, "Farmer's Call," Quincy, Ill.*

"WE are pleased to note the continued success of GOOD ROADS and feel sure that it is doing a good work in behalf of an important national subject."—*Harrisburg Foundry & Machine Works.*

"GOOD ROADS has been received. It ought to be in the hands of every civil engineer, street commissioner, street contractor, mayor and councilman in cities, and every road supervisor and intelligent farmer in the country."—*Weekly Ledger (New Albany, Ind.)*

"GOOD ROADS for June comes to our table with a splendid list of literary matter of the most important interest to those who have to do any amount of traveling over our miserable roads. The magazine, as its title indicates, is published especially for and devoted to the improvement of public roads and streets. The contents of the number is as follows: "Our First Artificial Road," Horace J. Smith; "A Word of Contrast," Charles Kendall Adams, LL. D.; "Asphalt and Its Uses," Col. Frances V. Greene; "Streets and Roads of Washington," Frank L. Dyer; "Dirt Roads and Gravel Roads," Isaac B. Potter; "A Famous Ghost Story," Bulwer Lytton; and the usual departments. Published in New York."—*Burlington Hawk-Eye, Burlington, Iowa, June 17, 1892.*

"GOOD ROADS is a magazine with a mission, and a good one. It is an elegantly printed monthly devoted to the improvement of public roads and streets. Every number is full of suggestion, information and argument. The May number, for example, contains brief articles on Ohio roads, broad-tired vehicles, roads and streets of Trinidad, dirt and gravel roads and carriage accidents, besides departments devoted to laws and legislation, popular opinion and queries and answers. This little magazine should be in the hands of every friend of road improvement."—*Detroit Tribune.*

"GOOD roads has become a subject of such widespread importance and popular interest that an illustrated sixty-page monthly magazine is issued under this title. It has already reached its sixth number, and enjoys a large and rapidly increasing circulation.—*Bangor Industrial Journal.*

"AFTER election we intend to send in the names of all the county road supervisors, and if they receive sample copies we hope they will indicate their interest in the subject by subscribing, for they can learn more in half an hour from this little [illegible] than in a year's experimenting."—*Yellow News.*

"GOOD ROADS has so much that is valuable and interesting upon the subject that it is wonderful how in a single month it can all be got together."—*Ohio State Journal.*

"A NEW monthly has been started called GOOD ROADS. The Log Cabin Club should prevail upon the mayor of Macon to subscribe promptly."—*Macon News.*

"GOOD ROADS is at hand. Every farmer, and villager, as to that, ought to read this magazine, devoted almost exclusively to the improvement of country roads. It tells what everybody knows, but it is not everybody that do as well as they know; if they did people would not plod along in road hub deep in mud when a proper use of the materials at hand will make good serviceable roads."—*The Weekly Review, Evansville, Wis.*

"GOOD ROADS is the title of a new monthly magazine, which certainly has an ample field in which to work, and it ought to fill 'a long-felt want.' Anything looking to the betterment of our highways should receive every encouragement." —*Milford Gazette.*

"GOOD ROADS is the name of a new magazine started by the League Roads Improvement Bureau. It is published in the Potter Building, New York, and its object is to so arouse public opinion in this country that we can get better roads than we now have. There is much in this magazine to interest not only cyclers, but all who for pleasure or business desire good roads and streets."—*Philadelphia Star.*

"GOOD ROADS is a monthly publication to be devoted to the promotion of good roads, the establishment of public parks, etc., in which it shows an earnestness of purpose and a capacity of excellence to attain its objects that must crown it with deserved success."—*Harrisburg Independent.*

"WE urge every farmer to read 'Gospel of Good Roads.' It is by far the ablest presentation of this important subject that we have ever read. It will be continued through the next two or three numbers of this journal with illustrations. The article is copied from GOOD ROADS, a new monthly paper published by the League Roads Improvement Bureau, Potter Building, New York City.

"The whole aim and object of GOOD ROADS is to make the farmer realize how poor are his roads and to teach him the cheapest and most durable method of improving them. It is ably edited by Mr. Isaac B. Potter and is well worth the price of subscription, $2. We believe it is destined to accomplish for the farmer greater and more lasting benefits than could be obtained by the agitation of any of the many economic questions now before the people."—*Wisconsin Weather and Crop Journal.*

CONTRACT NOTES

ROADS AND STREETS.

ARIZONA.—A contract has been let for building a $100,000 toll road from Phœnix to Globe. Part of the money was raised in the vicinity of Phœnix, the balance being subscribed by outside parties who are interested in the Globe mines. The work will be begun at once.

Nine hundred dollars has been expended by the Board of Supervisors of Yavapai County for improving the road from Castle Creek to Walnut Grove. This will be a through route to Prescott.

CALIFORNIA.—Property owners of San Francisco have petitioned the Board of Supervisors to make a special appropriation of $75,000 for necessary street improvements on Oak, Vell, Baker and Stanyan Streets adjacent to the Park. Sewers and curbs are necessary.

SAN DIEGO.—A stage road is being built to connect Ensenada and Tia Juana. Mexican soldiers are doing the work.

CONNECTICUT.—At New Haven there is talk of bonding the city for $500,000, to provide permanent pavements in the central streets.

Three thousand dollars has been subscribed by property owners in the neighborhood of Bantam Lake, Waterbury, for building a road around the lake. Most of this road will be through woods. About August 1 the work will be begun.

ILLINOIS.—Champaign is arranging to make four miles of paved streets the present year.

ROCK ISLAND.—City Clerk Robert Koehler is advertising for proposals for the improvement of Twentieth Street. The work will include excavating, grading, macadamizing, curbing and brick pavements. Bids must be accompanied by a certified check for $500.

ROCK CREEK.—Bids are asked for fifty rods of macadamized roads. Bids should be sent to C. P. Peterson, Clerk.

STREATOR.—By vote of the Council, Monroe Street will be paved with brick.

INDIANA.—A corporation to be known as the Leavenworth, Pilot Knob and Marengo Turnpike Company has been organized in Crawford County, to build a turnpike from Marengo on the Air-Line Railroad to Leavenworth. The capital stock of the company is $50,000, divided into shares of $10 each.

Bids are asked at Wabash for the completion of the work for the improvement of Manchester Avenue from the east line of Allen Street to the north line of Harrison Avenue to the south line of Gillen Avenue, by grading said portions of Manchester Avenue to the full width, including sidewalks and gutters on both sides, macadamizing and paving the sidewalks on both sides of said portions of the avenue. Plans and specifications will be furnished on application to the City Civil Engineer.

IOWA.—Bids are asked at Dubuque for improving the following streets: Clark Street, from West Locust to West Seventeenth Street; Windsor Avenue, from Lincoln Avenue to Garfield Avenue; Apple Street, from Rush Street to Cleveland Avenue, and Fourteenth Street, from Pine to Maple Avenue. All the work must be completed by September 1. Blank bonds for bidders will be furnished on application to J. C. Fitzpatrick, Recorder. Bids for each street must be made separately.

MASSACHUSETTS.—MALDEN.—The Board of Trade has voted unanimously in favor of paving the principal streets.

MICHIGAN.—The sum of $25,000 has been voted for paving purposes in Munroe. Brick will be used.

Bids are asked at West Bay City for furnishing material and constructing a pavement on Midland Street, from the Michigan Central Railroad east to the county line, forty-two feet wide with thirty-two feet of cedar and five foot cobblestone gutters, stone curbing one and a half inches, board foundation and drained with three inch drain tile. Plans and specifications are on file at the office of the Board of Public Works.

DETROIT.—Proposals are asked for grading, paving, etc., and for furnishing all the labor and material on the Boulevard from Woodward Avenue to the west curb line of Grand River Avenue, the southern roadway where not already paved. Said sections of the Boulevard are to be paved according to specifications for Telford macadam granite boulder pavement, as adopted by the Board and on file with the Engineer, in the office of the Commissioners of Parks and Boulevards, Room 9, Market Building.

MINNESOTA.—DULUTH.—Bids are asked for paving twenty-one blocks of Superior Street.

MISSOURI.—Sealed proposals will be received by the City Engineer of Kansas City for furnishing all the material and doing all the necessary work to complete city improvements, as follows: Grading alley between Flora Avenue and Vine Street, from Twenty-fourth to Howard Street; grading Seventeenth Street from Brooklyn Avenue to Prospect Avenue. Plans, specifications, etc., on application to City Engineer.

At Springfield, College Street is to be paved with brick, from the public square to Grant Street, and bids for the work should be sent to the City Engineer. Several other streets are to be improved, and about $50,000 will be spent on the work.

NEW JERSEY.—NUTLEY.—Bids are asked by the Clerk of the Town Committee for macadam and Telford roads.

NEW YORK.—The Department of City Works of Brooklyn asks proposals for grading and pavi

Gillen Place from Bushwick Avenue to Jamaica Avenue with granite blocks, also for grading and paving Pacific Street from Ralph to Howard. A separate bid, separately enclosed, must be made for each piece of work. Information can be had and plans and specifications seen, and forms proposals procured on application at the Department of City Works, Municipal Department Building, Brooklyn.

The Department also asks proposals for grading and paving Thirty-sixth Street from Fourth to Fifth Avenue with cobblestones.

BROOKLYN.—By order of the Board of Aldermen the following streets will be repaved with asphalt: Clinton Avenue from Fulton to Myrtle, at a cost of $35,000; Grace Court from Hicks Street east, to cost $4,000; Gates Avenue between Vanderbilt and Waverly Avenues, $3,700, and Hicks Street from Montague to Joralemon.

Bids are asked for grading and paving Degraw Street from Rogers to Bedford Avenue. Plans and specifications may be seen and forms of proposals procured on application at the Board of City Works. Another bid is asked as follows: For grading and paving Varick Avenue from Montrose Avenue to Flushing Avenue with cobblestone.

Bids are asked by the Commissioner of City Works for repaving four streets; granite blocks.

At a meeting of the Town Board, in conjunction with the Highways Commissioners, held at the Town Hall, in the village of Glencoe, it was decided to ask from the Board of Supervisors the sum of $36,000, for the purpose of macadamizing the Jerico turnpike, from the Jerico Hotel to the west line of the township, a distance of about two miles. It was also voted that permission be granted to expend $1,500 in improving the highway from Glencoe to Jerico, commencing at the Glencoe Railway Station.

At Rochester a contract for improving Plymouth Avenue was let to the Warren-Scharf Asphalt Co., for $58,843.20.

A large amount of brick paving and macadamizing is to be done at Ithaca during the present year.

NEW YORK CITY.—Bids are asked by the Commissioner of Street Improvements of Wards 23 and 24 for four contracts for paving and sewers.

BINGHAMTON.—Court Street is to be paved with asphalt at an estimated cost of $40,000.

BUFFALO.—Bids are asked for ten paving contracts by the Department of Public Works.

The Board of Public Works of Buffalo asks bids for repaving Main Street from Chippewa to Exchange, except the portion between Swan and Seneca, which is already paved with asphalt, and the portion between the street railway tracks. Four kinds of proposals are asked for, as follows: Barber's genuine Trinidad asphalt, German rock asphalt, brick and standard dressed block Medina sandstone.

Bids are asked by the City Engineer of Dunkirk for improving Second Street from the east line of the Brigham Road to the east side of Lion Street, by grading and paving or macadamizing same.

OHIO.—There is a petition before the Hamilton County Commissioners for a new road.

CLEVELAND.—By vote of the City Council it was declared necessary to improve Columbus Street to Loraine Street to the north curb line of Howard Street, by grading, draining, setting curbs, paving with Medina sandstone, the joints filled with concrete, to the established grade according to the plans and profiles on file in the office of the City Engineer.

The City Council has passed ordinances requiring the improvement of public streets as follows: Livingstone Street from Cedar Avenue to Central Avenue, to be graded, drained, curb reset and roadway paved with paving brick; Hill Street from Commercial Street to the east line of Cross Street, to be graded, drained, curbed and paved with Medina sandstone, the joints being filled with concrete; Fourth Avenue from Wilson to Second Avenue, to be graded, drained, the curb reset and the roadway paved with paving brick; Beach Street from Central Avenue to Scofill Avenue, to be graded, drained, curbs reset and roadway paved with paving brick; Croton Street from Humboldt Street to the west curb line of Case Avenue, to be graded, drained, a portion of the curb reset and roadway paved with Medina sandstone; Clinton Street from the west side of Hanover Street to the east curb of Liberty Street, to be graded, drained, curb reset and roadway paved with paving brick; Wheller Place from Central Avenue to Eagle Street; Bolivar Street from Erie to a point 892 feet east from Erie Street, to be graded, drained, the curb reset and paved with dressed block Medina sandstone; Hamilton Street from Ontario to Wood Street, to be graded, drained, curbed and paved with best block Medina sandstone; Broadway from the west curb line of Union Street to the southeasterly line of Miles Avenue, to be graded, drained, curbed and paved with best block Medina sandstone; Central Avenue from Wilson Avenue to the Cleveland and Pittsburgh railroad track, to be graded, drained, the curb reset and paved with best block Medina sandstone; Wheller Place from Central Avenue to Eagle Street, to be graded, drained, flagged, paved with Medina sandstone and the joints filled with concrete. Full particulars may be had on application to the City Engineer.

MANSFIELD.—Bids are asked for three paving contracts.

CINCINNATI.—Bids are asked by the Board of Administration for paving one street with brick and one with macadam.

CHARTIERS BOROUGH.—Bids are asked by the Chairman of the Street Committee for paving three streets with brick.

ZANESVILLE.—Bids are asked for paving eleven streets. Plans and specifications may be had on application to W. M. Shinnick, City Clerk.

PENNSYLVANIA.—NORRISTOWN.—Bids are asked for the improvement of Dekalb Street from the south line of Main Street to the Schuylkill Bridge, by grading and paving with stone blocks, asphalt blocks and vitrified brick. Plans and specifications, etc., can be seen at the office of the City Engineer.

Forty streets in the uptown district of Pittsburgh will be repaved at an early day. Thirty-seven contracts for repairing city streets were let to Booth & Flinn and Sloan & McIlwaine. The aggregate sum of the contract amounts to $300,000.

In Norristown proposals are asked for improving Main Street from the east line of Arch Street to the east line of Dekalb Street, and from the southeast side of Swede Street to the tracks of the Junction R. R., by grading and paving with stone and asphalt blocks and vitrified brick.

John N. De Groot, Chairman Street Committee, Bristol, Bucks County, wants names and addresses of contractors for building a macadam road about 1,200 yards.

At Lancaster a contract for gutters was awarded to T. G. Bach at two and a half cents, the city to furnish the material, and a contract for street crossings was awarded to Frederick Wagner.

At New Oxford a movement is on foot for the building of a turnpike from Mount Rock to Merrystown.

ERIE.—Ordinances have been passed for 1.41 miles of asphalt pavement to be laid during the present season. This will make 15.55 miles of streets paved, of which 6.86 miles is of Medina stone and the balance asphalt. Approximate estimate has been made for brick pavement on Seventeenth Street between Peach and Cascade Streets, 5,808 lineal feet and 19,769 square yards. Ordinance for same is now on passage through Councils.

READING.—City Engineer Hoff presented the following report of the estimated cost of a proposed boulevard to the committee interested in it: Cost of macadamizing twenty feet width, $15,750; forty feet width, $31,061; fifty feet width, $39,375. George W. Beard was appointed treasurer of the fund to pay preliminary expenses.

The borough of South Bethlehem asks proposals for grading and surfacing certain of its streets, for which about 8,500 cubic yards of excavating will be required, and for construction of drains along or across said streets. All information can be had on application to the Engineer of the borough, at 122 East Third Street. Each bid must be accompanied by a bond for $3,000 with two sureties.

VIRGINIA.—A contract for paving one of the principal streets of Lynchburgh with vitrified brick was awarded at $1.68 per square yard.

Richmond will spend less than $75,000 on its streets this year.

WASHINGTON.—Contracts for the grading of four streets at New Tacoma were let as follows: To W. C. Smith, at a bid of $2,135, for grading Myrtle Street, from Pine to Bush; to W. I. Moulton for $924, for work on Puget Sound Avenue, from D to the alley in Block 78; to Ed. S. Orr, at $8,986, for N Street in the sixth addition through whole length of section 17; for $1,425 to W. C. Smith, for grading Boylston Street, from Twelfth to Sixteenth. Work is to be begun at an early day.

WEST VIRGINIA.—About twenty squares of street paving is to be done in the city of Huntingdon. Bids are asked for the work on same, and will be received by L. W. Lute, City Engineer.

Sealed proposals are asked and will be received at the office of the Board of Public Works of the city of Wheeling for paving streets with vitrified paving brick. Bids must be by the square yard, the city to furnish the brick and tar. Specifications can be seen at the office of the Board. The bidder to whom the contract shall be awarded will be required to give bonds with two securities in the sum of $2,000.

BRIDGES.

FLORIDA.—ST. AUGUSTINE.—A company has been incorporated here, to be known as the St. Augustine Bridge Co., for the purpose of building, maintaining and operating a toll bridge between St. Augustine and Anastasia Island.

MASSACHUSETTS.—LAWRENCE.—The Common Council at their last meeting adopted the order for construction of a bridge across the Spicket River at Bennington Street. Bids are asked for a bridge at Short Street.

WILLIMANTIC.—An iron bridge is to be built on the Providence Division of the N. Y. & N. E. R. R., on South Main Street, instead of the old wooden one.

NEW JERSEY.—PATERSON.—A committee appointed for that purpose, has reported the necessity of a bridge in the vicinity of Little Falls, and they estimate the cost at $7,000 for superstructure and $3,500 for masonry. Bids will soon be asked.

HACKENSACK.—At a meeting of the Councilmen, $1,200 was voted for a bridge near Shadyside, and on motion of Alderman Dennett, a like amount was appropriated for a bridge across the Saddle River in Orvil township.

NEW YORK.—BUFFALO.—Bids are asked for the construction of a steel arch bridge, masonry, retaining walls and filling complete on Elmwood Avenue over Scajaquada Creek. Plans, etc., can be seen at the office of the City Engineer.

OHIO.—DELAWARE.—Proposals are asked for the work of constructing a stone arch bridge over the run in Berlin Township. The County Auditor is J. J. Ramage.

LANCASTER.—Bids are asked for masonry for two abutments and for the superstructure of a bridge in Greenfield township. The distance between the abutments at top is fifty feet. The height is from twelve to fifteen feet. For information, address R. F. Brown, Auditor.

PENNSYLVANIA.—OIL CITY.—A new railway bridge will have to be constructed between this city and Rousenville to replace the one which has been so badly damaged by the recent floods.

NORRISTOWN.—Bids are asked for the repairs on a stone bridge over Sawmill Run Creek, on the Germantown pike. S. R. Anders is one of the Commissioners.

MCKEESPORT.—A number of bridges are to be built here. One to cost about $50,000, to connect Boston and Grenoak; one to cost $6,000, between Suter and Douglass, and a railway bridge to connect the Waverly Coal Co. with the Pittsburgh, McKeesport & Youghiogheny R. R.

TITUSVILLE.—It is stated that the Pennsylvania R. R. Co. will put in a new draw on the Bay Bridge.

TENNESSEE.—HARRIMAN.—A $14,000 bridge is to be built over the Emery River.

KNOXVILLE.—The contract for the bridge across the Tennessee at this city, has been awarded to the Groton Bridge Manufacturing Co., of Groton, N. Y., for $69,332. There will be sixteen spans, thirteen of which will be fifty feet, two will be 150 feet and one 260 feet. The roadway will be twenty feet; two six foot walks and iron substructures.

WISCONSIN.—MONROE.—Proposals for the construction of an abutment at the north end of the Monroe Street bridge will be received by the City Clerk.

MILWAUKEE.—The city has accepted plans for a three span iron highway bridge over the North Ravine in Lake Park, and bids for the work will soon be asked.

SEWERS.

ARIZONA.—PHŒNIX.—The city is to have a sewer system and the surveys are now being made.

COLORADO.—PUEBLO.—A system of sewers is to be built in two districts, by order of the Council.

CONNECTICUT.—MERIDEN.—Sewer contracts for Sections 2, 3 and 4 were awarded to A. Brazos & Son, of Middletown, at $79,376.

ILLINOIS.—ROCK ISLAND.—Bids are asked by the Sewer Committee for a thirty-six inch tile sewer.

Cicero is to have a sewer system to cost about $350,000.

Belleville is to have a complete system of sewerage, and the work will probably be commenced at an early day.

WAUKEGAN.—Bids are asked by the City Council for the construction of six and a half miles of sewers, with necessary appurtenances. Plans, etc., may be seen at the office of the City Clerk.

IOWA.—BOONE.—Plans for a sewer system are being prepared by M. R. Laird, of Des Moines.

MAINE.—It has been voted by the Council of Auburn to construct sewers in seven streets.

MASSACHUSETTS —LYNN.—The City Treasurer is authorized to issue sewer bonds for $20,000.

WORCESTER.—Pipe sewers have been ordered by the Council to cost about $12,000.

BOSTON.—Bids are asked by the Metropolitan Sewerage Commissioners for work on Section 7 of the main sewer in Winthrop and East Boston.

BROCKTON.—The city sewerage bill has been signed by the Governor.

NEW HAMPSHIRE.—ROCHESTER.—Bids are asked for about twelve miles of six to twenty-four inch sewer pipe.

NEW JERSEY.—ORANGE.—Bids will be received by C. P. Bassett, Chief Engineer, for eight miles of eight to twenty-four inch pipe sewers.

PATERSON.—Arrangements are under way for the construction of several twelve and eighteen inch pipe sewers. Information may be had of J. C. Hendrie, Clerk, Board of Public Works.

NEW YORK.—NEW YORK CITY.—Bids are asked for three sewer contracts by Commissioner Gilroy.

Bids are asked at Yonkers for construction of sewers in five streets, and should be sent to John Pagen, Jr., City Clerk.

BROOKLYN.—Bids are asked for sewers in six sections of sewer district No. 39.

TROY.—Bids are asked for a brick sewer in one street. An eighteen inch pipe sewer is to be laid in one street, the plans for which are completed.

GENEVA.—A sewer system estimated to cost $100,000 is being agitated.

HERKIMER.—Plans for a proposed sewer system prepared by Mr. Baxter, of Utica, have been submitted.

BINGHAMTON.—Bids are asked as follows: For two salt-glazed vitrified pipe sewers, eight to fifteen inches in diameter, and a brick sewer thirty-two by twenty inches.

BUFFALO.—Bids are asked by the Department of Public Works for twelve to twenty-four inch tile sewers.

A company is being formed at Mount Morris to construct a system of sewers.

The Council of Middletown has voted in favor of several sewers.

Bids are asked at Watertown for the construction of a sewer in Emerson Street.

AUBURN.—Bids are asked and will be received by the City Clerk for a sewer in Ward 5.

OHIO.—PIQUA.—Bids are asked for sewer extensions.

CLEVELAND.—Bids are asked for a sewer in Burton Street.

COLUMBUS.—Bids are asked by the Board of Public Works for 5,600 feet of twenty-four to fifty-four inch main sewer.

TIFFIN —Plans for sewer extensions are being prepared by the City Engineer.

MARIETTA.—Plans are being prepared by J. W. Hill, of Cincinnati, for a sewer system.

PENNSYLVANIA.—CARBONDALE.—Proposals are asked and will be received by the City Clerk for the construction of about 18,000 lineal feet of main and lateral pipe sewers. Plans and specifications, etc., can be obtained at the office of the City Engineer, in the City Hall.

SOUTH DAKOTA.—SIOUX FALLS.—Specifications for a complete system of sewerage are in course of preparation by the City Engineer.

VIRGINIA.—The town of Lexington is to have a new sewerage system in the southwest portion of the town, and Prof. D. C. Humphreys is now at work on the survey.

ROANOKE.—Bids are asked by the Board of Public Works for a forty-eight inch circular brick drain 985 feet long, and a six by eleven inch brick and rubble drain, 1,700 feet long.

WASHINGTON.—SPOKANE.—Two pipe contracts have been let as follows: to R. A. Jones, at $27,806, and to the Washington Pipe Co., at $4,600.

PUYALLUP.—Plans for a drainage system to cost $16,500 have been accepted by the city, and bonds for the amount will be issued.

MONTESANO.—Resolutions have been passed by the Business Men's Club in favor of bonding the city for $40,000 for sewers and other improvements.

WISCONSIN.—MILWAUKEE.—Pipe sewers are to be laid in sixteen streets.

BORROWED WIT

CONVINCING PROOF.

Brer. Johnsing—Hab n't yo' nebber heered dat some ob de 'Postles war brack ?

Elder Snowball—I reckon some ob 'em war; else I can't see w'y Sain' Peter sh'd 'a' b'en so 'sturbed by dat rooster's crowin'. —*Puck.*

Friend (to saloonkeeper)—How's the whiskey business, old man ?

Saloonkeeper (enthusiastically) — First rate: couldn't be better. I've just got in the finest lot of tripe and pig's feet you ever tasted, and two oil paintings that cost me $10,000 apiece. Give the boys plenty of art and pigs' feet, and you can catch 'em every time.

Teacher—Johnnie, do you know the nature of an oath?

Johnnie—Yes'm. It is something that a man gives when he wants to be believed.

Teacher—That is right. Now, let us have it illustrated. Johnnie, suppose your father should swear to your mother that he would be at home at 10 o'clock in the evening. Where would he be at that hour ?

Johnnie—In Tim Doogan's barroom.

AT THE BASEBALL GAME.

Now doth the downtown merchant gay
Off from his office sneak,
On plea of illness dire at home,
One afternoon each week;
And as he cheers the baseball game
With loud, ecstatic joy,
He sees upon the bleaching boards
His clerks and office boy!

—*New York Herald.*

Clerk (to Mr. Isaacstein, in the back room) —The shentlemens vat vos looking at dot seventeen-tollar coat says he vas a Free Mason.

Mr. Isaacstein—I symbathize mit dose Masons. Throw him in a pair of suspenders.

Clerk—He says he vill gif five tollar for dot coat.

Mr. Isaacstein—Vell, let him haf the coat, but don't throw in dot suspenders.

AND MUD.

We're duly thankful that the rain
Has seen fit to retire,
Though we admit that while 'twas here
'Twas something to add mire.

—*Indianapolis Journal.*

NOT MUCH OF A JUMP.

"This is the biggest jump on record —a Providence man has jumped the State."

"Oh, pshaw! that's only Rhode Island! Now if it had been Texas—"—*Puck.*

English Auctioneer—With my 'ammer in my 'and, this 'ere 'oss is put hup for sale and without hany guarantee. With your heyes hopen you buy 'im. I am bid two quid for a twenty-quid 'oss. Three quid is it? 'Is 'ide and bones are worth that.—*Rider and Driver.*

An old Puritan clergyman once used this language in praying for rain; "O Lord, Thou knowest we do not want Thee to send us a rain which shall pour down in fury and swell our streams and carry away our haycocks, fences and bridges; but Lord, we want it to come drizzle-drozzle, drizzle-drozzle, for about a week. Amen."

Scene: On a bad road. "The doctor ordered me to take plenty of fresh air, but blamed if he ordered me to take all this stale dust."

"I just rolled over some of the worst hills in this State."

"Well, I'm glad to hear it, for from the looks of your suit I was afraid that some of the worst hills in this State had rolled over you."—*Wheelman's Gazette.*

"So you do not cherish any superstitions, dear?"

"No, indeed. Why, I have always made it a point to be married in black, and have been lucky every time."—*Indianapolis Journal.*

The Pope Manufacturing Co. Essay Contest.

AWARD OF PRIZES.

NAMES OF SUCCESSFUL CONTESTANTS.

SOME months ago the POPE MANUFACTURING COMPANY, with its accustomed enterprise, offered one hundred bicycles as prizes to the authors of the one hundred best published essays on "*Good Roads*;" the requirements being that each essay must not include more than five hundred words, and must be printed in some regular publication, of which marked copies containing the several Prize Articles were required to be sent to the POPE MANUFACTURING COMPANY on or before the first day of May last. The contest was limited to students of high schools, preparatory schools, academies and colleges. In the award of prizes the subject matter of each essay was examined with reference to the following points:

1. **General Adaptation to the Subject.**
2. **Practical Value of Suggestions.**
3. **Evidences of Study Given to the Question.**
4. **Style and Clearness of Diction.**

Pursuant to the announcement made in the circular offer issued by the POPE MANUFACTURING COMPANY, GOOD ROADS takes pleasure in publishing the following list of successful contestants. A letter from Mr. R. L. WINKLEY (representing the POPE COMPANY) informs us that there are eleven prizes not yet awarded, but that the names of additional winners will be sent to GOOD ROADS as soon as possible and probably in time for publication in our August issue. The following is the successful list as far as determined:

J. L. McGhee, Pearisburg, Va.
E. H. Jones, Nashville, Tenn.
H. E. Allen, Oakland, Cal.
H. C. Rowley, San Francisco, Cal.
J. B. Harden, Tribune, Kans.
John Van Voorhis Gould, Solomon City, Kans.
Chas. Van Horn, Albion, Ia.
P. F. Carpenter, Cedar R'pids, Ia.
W. H. Webster, Des Moines, Ia.
Reuben H. McDermid, Minneapolis, Minn.
Robert L. Pollock, Northfield, Minn.
Charles G. Porter, Owatonna, Minn.
Fred. C. How, Baltimore, Md.
Thos. A. Jenkins, Baltimore, Md.
Lawr'ce E. Baker, Auburn, Ala.
Geo. Grandberry, Brewton, Ala.
Allen S. Cook, Newberg, Ore.
J. B. McDonald, Conway, Ark.
C. B. Reggin, Conway, Ark.
Geo. O. Coburn, Ft. Morgan, Col.
Jas. V. Bowen, Brook Haven, Miss.
Thos. B. Dudley, Winona, Miss.
Arthur Kaiser, Ithaca, N. Y.
Francis E. Bauch, Br'klyn, N. Y.
J. G. Schillinger, Ithaca, N. Y.
Milton E. Gibbs, Geneseo, N. Y.
Harry K. Van Alstein, Lockport, N. Y.
Clarence A. Miner, Watertown, N. Y.
Robt. M. Huntley, Amsterdam, N. Y.
Benj. R. Burville, Crete, Ill.
Theo. A. Butterworth, Quincy, Ill.
A. D. Thompson, Champaign, Ill.
Henry Gillespie, Galesburg, Ill.
C. B. McClure, Champaign, Ill.
Geo. A. Haynes, Island Pond, Vt.
Albert H. Murdock, Ypsilanti, Mich.
Roy R. Bailey, Hillsdale, Mich.
Gussie Stellwagen, St. Ignace, Mich.
Eugene L. Mundin, Worcester, Mass.
Arthur C. Mack, Andover, Mass.
H. E. Riley, Northampton, Mass.
W. C. Lovejoy, Newnan, Ga.
S. M. Dow, Redfield, S. Dak.
Asa G. Randall, Hanover, N. H.
John W. Stockwell, Jr., Portland, Me.
R. C. Faught, Waterville, Me.
Chas. E. Garvin, Wheeling, W. Va.
G M. Ford, Morgantown, W. Va.
Galvin Gillis, Jr., Palatka, Fla.
P. F. Henderson, Aiken, S. C.
Henry A. Edwards, Sellers, S. C.
J. C. Futrall, Charlottesville, Va.
J. H. Underwood, Dayton, Va.
Fred. Graef, Jr., Milwaukee, Wis.
Wallace M. Short, Beloit, Wis.
Sam'l S. Crippen, Fond-du-Lac, Wis.
B. E. Saxton, New London, Ct.
Lucian E. Parker, South Coventry, Ct.
W. A. Miller, Washington, D. C.
L. G. Eldred, Ellensburgh, Wash.
Jesse D. Moffitt, Pilot Point, Tex.
Paul J. Beaumont, Bryan, Tex.
Buell C. Pittuck, College Station, Tex.
W. Chesterfield Myers, Lincoln, Neb.
H. B. Alexander, Syracuse, Neb.
F. F. Weld, State College, Pa.
W. H. Losch, Larry's Creek, Pa.
Avra Pershing, Greensburg, Pa.
H. B. Oves, Altoona, Pa.
Robert Iris, Greensburg, Pa.
D. V. Smith, Burlingame, Pa.
Reed McBurney, Primrose, Pa.
J. H. Wisby, Middletown, Del.
Arthur Campbell, Toledo, O.
W. C. McCullough, Bucyrus, O.
H. P. Glidden, Cleveland, O.
James S. Glenn, Columbus, O.
E. M. Robinson, Sunbury, O.
Chas. Baender, Jr., Moberly, Mo.
C. J. MacChaney, Independence, Mo.
R. L. McElroy, Louisiana, Mo.
W. A. Garland, Wake Forest, N. C.
Houston Neal, Wake Forest, N. C.
Geo. W. Paschal, Wake Forest, N. C.
H. E. Cole, Pierceton, Ind.
Wm. L. Sedgley, Bloomington, Ind.
Earle Eugene Martin, Moore's Hill, Ind.
Harry S. Dunning, Princeton, N. J.
John E. Cameron, Jersey City, N. J.

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VOL. 2. AUGUST, 1892. NO. 2.

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ISAAC B. POTTER
Managing Editor
PUBLICATION OFFICE
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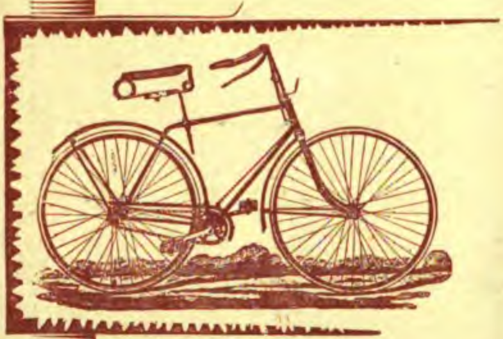

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GOOD ROADS.

Vol. 2. **August, 1892.** **No. 2.**

COMMERCE DEMANDS BETTER ROADS.

By Colonel J. A. Price, Vice-President National Board of Trade.

WHEREVER there is a great public highway, there is civilization, prosperity, value, cultivation. Isolation of communities is barbarism. The man who first placed a log across a stream, corduroyed a marsh or leveled a crag, took the first step towards civilization. He deserves a monument.

The question of road making is no less a question of civilization to-day. The greatest physical issue of the future is that of roads and road building. America is farthest behind of all the nations; considering the great country and its infinite resources, we do not contrast well with the conditions of darker continents. Compare our systems of highways with those of Great Britain, of France, of Norway, of Germany and of Italy, if you please, and our patriotic fervor must diminish most discouragingly.

COL. J. A. PRICE.

In our haste to be prosperous, well-to-do, rich, we have rushed along the lines of selfish interest, of monopolies and of aggrandizements, and colossal fortunes have been the cynosure, the attraction and the reward of our genius and our toil. We have, in consequence, the grandest private estates, the most brilliant corporate establishments and a bewildering railway development; and yet with all we sink back desperately near to a point that is a sad reflection on our pride, when we contemplate the public ways between the towns and through the rural districts of the entire country. We appear to have forgotten the grand principle that civilization is a result of the ease and readiness with which the race communicates and interchanges with itself. We have been too apt to purr at the praise with which our success has been noted and so lose for ourselves the catch before us.

It is a lamentable fact, that must be regretfully acknowledged, that American enthusiasm responds all too readily to the prick of self-interest, and to this end it endures the sacrifice of important public considerations; like a spur, it excites all the magnificent energy and prolongs the most stupendous effort of this mosaic of races and this wild cosmopolitan condition. Perhaps it is threatening the Republic, for it is depopulating the country and over-crowding the city.

Plato gave us a republic founded upon sentiment; the Arcadia of Sydney is but a dream; real republics represent the selfishness of the many as monarchies represent the selfishness of the few, who shall probably never be able to crystalize upon the sentiment or to materialize on the dream; yet we can modify, control and direct the selfishness of the many by the agitation and education of selfish instincts.

As our cities are growing to their own detriment as against the evident opposite tendency of the country districts, it is only a question of time when the climax will be reached in disaster. A parallel statement in regard to the growth of public enterprise at the expense and sacrifice of the means of communication, and hence the lack of growth in the country, may be asserted with force and may pass without successful contradiction. If we would save the value of the farm, preserve the stable population of the rural districts, attention must be given to the serious condition that confronts us. Public thought must be stimulated upon the subject and public action must be demanded.

Road legislation in the United States is about as inefficient as it can be. The necessity of a great development in the improvement of country roads is not yet fully appreciated. What we have exhibited in railway construction in the last half century must be repeated on the wagon-road feeders to railway, factory, market town and city development throughout the whole country, or we shall lose our grip and progress.

Economic conditions are certainly directing attention along the development herewith intimated. The lowering value upon the rural acreage and the inordinate increase of that of cities and towns are corresponding indications. The farm is abandoned because of its isolation; the farmer is poor because he cannot get to market and because the younger helpful portion of his family constantly gravitate to the greater attraction of the town and city, where going and coming are easier, where mails are oftener and where rational engagement as well as dissipation centres. Nothing contributes to this condition as does the roadway on which easy and rapid transit is impossible.

Since these things are acknowledged to be too true, it is an encouraging sign of the times to see the local boards of trade, chambers of commerce and other business men's associations taking up the question from a commercial as well as an economic point of view. There are in existence upwards of thirteen hundred boards with an aggregate membership of over five hundred thousand business men and firms. The Scranton Board of Trade sent up to the National Board for action the following resolution, viz.:

"*Resolved*, that the National Board of Trade recognizes the exceeding poverty of the country even amid riches, in the universally deplorable condition of its public highways, considers the same a positive obstruction to progress and an exhaustive extravagance, and favors every measure far and near that will tend to remedy this evil."

This action on the part of the Scranton Board is meeting with universal approval both locally and throughout the State of Pennsylvania. The demand is being reiterated throughout the State and the people are aroused as never before, and road building must be an important factor in the future.

The Rochester Chamber of Commerce has also added its voice to the demand for state and national legislation for better roads. A series of explicit resolutions were forwarded to the National Board of Trade making an emphatic demand for a change of system in regard to road laws. The Rochester Chamber applies the rules and laws of business and asks that there shall be a change of front from road tinkering to radical engineering in a broad sense, and makes public the following resolutions:

> "*Whereas*, it is generally conceded that the average condition of the public highways of the United States is so bad as to be detrimental in a serious degree to the interests of trade, commerce and agriculture; and
>
> "*Whereas*, it is apparent that it is the system generally prevailing of depending on localities to construct and repair our roads, that is responsible for the deplorable condition of our highways; therefore
>
> "*Resolved*, that the National Board of Trade recognizes the fact that no improvement in the condition of public highways is possible or probable while the present system of constructing and maintaining public highways in the country is continued; and
>
> "*Resolved*, that this body favors a system that will provide for the immediate improvement of public highways, and which will be controlled by the Governments of the several States."

The National Board of Trade in turn passed upon these resolutions without a dissenting vote and appointed a competent committee, of which Mr. P. S. Townsend, of Rochester, is chairman, to conduct an investigation throughout the country.

It is recognized that legislation on the subject of road making must be directed from the old into new channels, that experience, skill and talent must be commanded as railway building commands them, and that the methods of the most skillful engineering must be adopted to insure the best, broadest and most permanent results. To accomplish this, it is eminently wise and most fitting that the commercial borders of the country should institute a comprehensive and thorough plan of reorganized legislation and business enterprise, until an universal agitation on the basis of the commercial advantages to accrue from the combined effort of towns, cities, states and national governments takes the place of the present confusion, uncertainty and incompetency, and until we are aroused from the lethargy that threatens the prosperity of the land.

Commerce and agriculture can here unite on a common platform, in a common cause and to a common end. The time is ripe for enterprise. Values will accrue to both city and town with every step of progress. All that is needed is to obtain a recognition of the cause and it will triumph. Concerted action should be determined upon, local organizations should be appealed to, and association as in church, in charity and in politics should be invited, until all communities are educated into demanding this most desirable revolution of the age.

The legislation assemblies convene during the coming Winter. The various proposals should be harmonized and unified, so that instead of a scattered and inefficient pursuit, all the force that can be aroused shall be concentrated upon definite and progressive lines.

A preliminary convention of patriotic citizens might, with good effect, be called together during the early Fall in such a place as the city of Buffalo or Pittsburgh, or other equally central locality, to devise a plan of campaign in which the press, the pulpit, associations, governors, legislators and citizens generally shall be importuned to take part in the future work. The engineering world would become alive to this greatest of all engineering developments and the cause would soon enforce its own merit and conviction. We shall some day see the advantage of helping ourselves and obtaining a greater help by the associated influences than by any possible individual expenditure.

The contemplated world's exhibit at Chicago during the coming year invites us to set the machinery into action now. No greater contribution could be made than the opening of a section devoted to all the systems and varieties of road making, both past and present, and there is no department of the exhibit that could be made more universally interesting and profitable to the agitation in America.

DEATH VALLEY BORAX WAGONS.

By C. M. Plumb, of Oakland, California.

It may appear somewhat strange, but it is nevertheless true, that one must "go outside" to find the largest and most economical road wagons ever built in this country. The term *outside* means out upon the desert, beyond the bounds of civilization and the influence of newspapers, mail, churches or markets, upon the open, treeless plain, under the blue, unclouded sky. Among the few denizens of the desert a trip to the railroad is invariably spoken of as "going inside."

C. M. PLUMB.

If there is a term of drearier significance, as applied to any portion of this vast country, than the "Mohave Desert," it is the name of that particular portion of it which, by reason of its tragical history, has been termed "Death Valley."

The larger area has no very well defined bounds, and there is scarcely a limit to its present barrenness. That portion within the State of California extends some 200 miles westward from the Colorado River, and has a length nearly twice as great. It is not a region of simple alkali plains, but of diversified mountain ranges, immense sloping valleys, dry lakes and sunken river beds, a desert of sandy and rocky desolation.

The deep sink in the northerly portion of this desert lay in the pathway of the overland emigration of '49 and '50, which at Salt Lake divided, one division moving southerly and entering California by way of Cajon Pass.

The fatality attending one of these early emigrant parties, with the exaggerations of tradition as to the deadly character of the valley atmosphere, have fastened the name upon a section which, though hot beyond endurance at some seasons, has its springs and well-watered tract where verdure is not unknown.

A fact of peculiar and somewhat romantic interest is that the only product of value from this region of fatal barrenness and heat is that rare preservative, borax. The usual form in which this useful staple is found is that of a white deposit, or exudation rather, from the marshes, where it lies spread out like a snowy lake of Desert *Manna*, as indeed it proves to be. Passing strange that this Valley of Death should pour out a harvest of nature's most potent preservative and purifier!

ON THE ROAD FROM DAGGETT TO THE CALICO BORATE MINE.

The necessities of the transportation of this borax to the railroad for market led to the construction of the wagons whose remarkable size and economy render them worthy of presentation to the readers of GOOD ROADS. A study of the dimensions and carrying capacity of these huge vehicles will justify their reproduction, and, with the story of their use, may interest those who are considering the subject of transportation upon earth roads.

The difficulties to be overcome in moving borax from Death

Valley were neither few nor trifling. The distance to Mojave, the nearest railroad station, was 160 miles. The entire way was unrelieved by a single human habitation, and possessed only two or three springs of water. These were some twenty-five miles apart, and at a distance of fifty miles from either end of the road. It was found that a loaded team could make but from fifteen to seventeen miles per day, which compelled the carrying of three days' supply of water, as well as all the food required for men and animals.

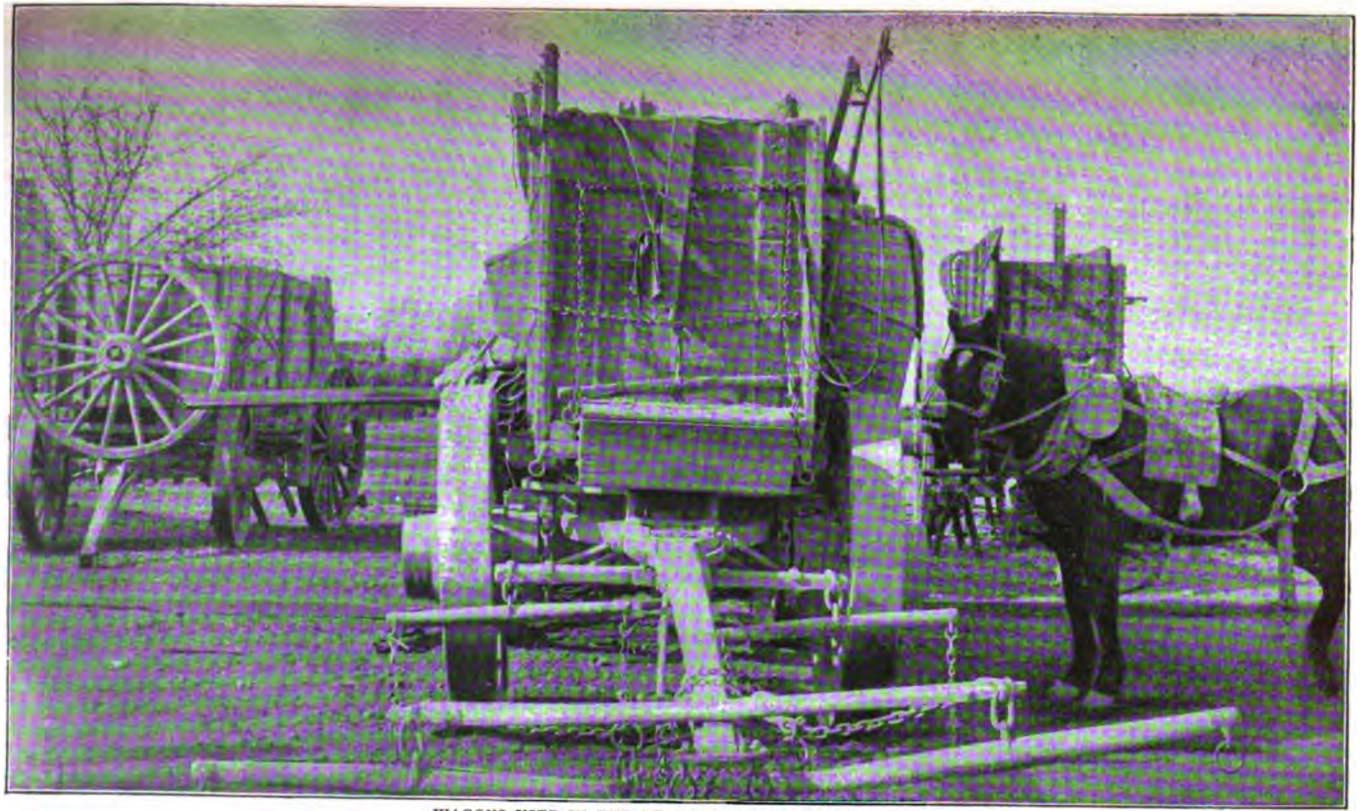
The fierce heat of that region necessitates the consumption of very large quantities of water to avoid suffering, as evaporation is so rapid.

The problem before the enterprising Superintendent, J. W. S. Perry, of the Pacific Coast Borax Company, at Daggett, was to construct a wagon that would carry at least ten tons—a train of two wagons hauling two carloads of borax—not over a smooth iron track but over mountain ranges, up long and toilsome ascents, and through narrow rocky defiles.

The construction of these wagons was accomplished by faithful days' work, nearly ten years ago, and so well were they built that with all the fearful strain and peril of the road, there was not a single breakdown for five years. Some of them are still in constant use for the shorter haul from the Calico Borax Mines to Daggett.

The exact dimensions of these wagons are as follows: The hind wheels are seven feet in diameter, the front wheels five, and the tire eight inches wide and one inch thick. The hubs are eighteen inches in diameter and twenty-two inches long. The spokes were made of split oak, five and a half inches wide at the butt and four at the point. The felloes were made double, of four by four pieces bolted together. The axles were of solid steel, three and a quarter and three and a half inches square. The wagon beds are sixteen feet long, four feet wide and six feet deep. The tread of the wagons is six feet, their weight 7,800 pounds each, and the cost about $900.

It is noticeable that while a railroad freight car weighs over one-half its greatest load, two of these Death Valley wagons, weighing less than eight tons, often carry twenty-two or twenty-three tons of borax besides the casks of water and feed for the twenty animals!



WAGONS USED IN THE DEATH VALLEY BORAX TRADE.

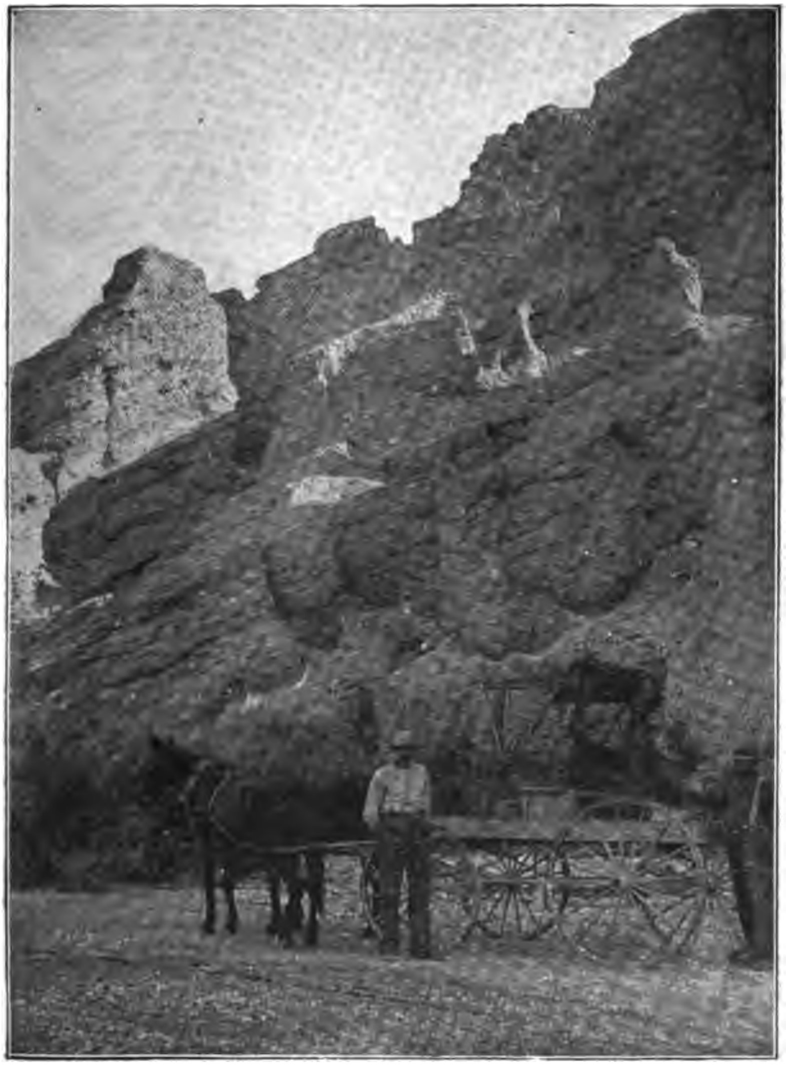
Two of these wagons are joined together, and between the springs and dry camps a tank wagon is also attached for water, the whole train drawn by two horses and eighteen mules! The horses are placed at the wheel and the most intelligent span of mules in the lead. The doubletrees are attached to a heavy chain leading from the front axles of the wagons. The driver seated either upon one of the wheel horses, or upon the load, governs his team by means of a small rope 120 feet long, called a jerk line, attached to the bit of the rear leader.

Mr. J. R. Spears, of the New York *Sun*, has given the following readable account of this team, which he saw on the desert:

"If historians and poets have been justified in writing rapturously about the Arab and his steed, what may we not say of the Death Valley teamster and his mules? To see him soar up over the front wheel to his perch, tilt his hat back on a rear corner of his head, gather in the slack of the jerk line, loosen the ponderous brake and awaken the dormant energies of the team with 'Git up—you; git up,' is the experience of a tourist's lifetime. One wants to be introduced and shake hands as with 'one whom lesser minds make boast of having seen.' And when one sees the mules settle forward in their collars, feeling gently of the load, until at last the chain stretches as firm as an iron bar, and then with one accord start the train of well-nigh 60,000 pounds weight almost as though it were naught, he wants to be introduced and shake hands with the mules too—that is figuratively speaking. Their intelligence is such that he would be proud of a speaking acquaintance with them, but if he knew the mules he would be a little shy about getting within hand-shaking range.

"It is wonderfully interesting, too, to watch the mules as they turn a sharp corner in a cañon or on a trail where it rounds a sharp turn on the mountain side. Team after team near the end of the tongue, often without a word from the driver, will jump over the long chain and pull away on a tangent that the heavy load may be dragged around. Even the novice wonders how they succeed, for some of the curves are so sharp that the leaders are seen pulling in one direction while wagons are travelling very nearly in an opposite one.

"In freighting over the desert with a twenty-animal team every driver has an assistant, called a swamper. The swamper's duties are multifarious. On a down grade he climbs to a perch



FURNACE CREEK, ON THE ROAD TO DEATH VALLEY.

on the rear wagon and puts on the brake; on the up grade he reasons with and throws rocks at the indolent and obstreperous mules.

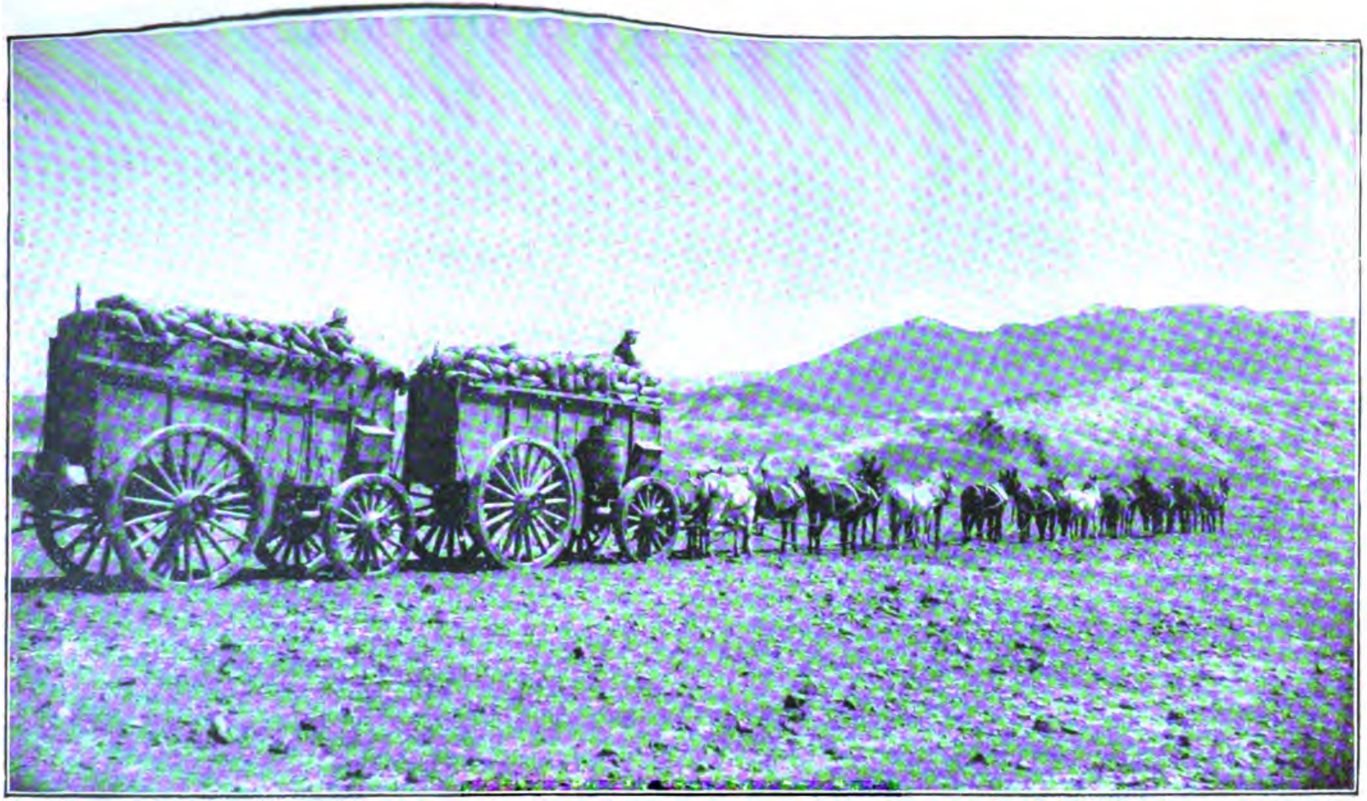
"The mules get their grain from boxes, which are arranged to be secured to the wagon tongue and between the wheels, when feeding. They eat their hay from the ground. Beyond feeding and watering, the animals get no care—they curry themselves by rolling on the sand, and rolling with cyclonic vigor at that. The cloud of dust raised when an outfit of mules starts in for a lark is suggestive of a Death Valley sandstorm. But the work is not wearing on the animals. It is common and polite to say to a driver when a thin or scrawny mule is seen in a big team: 'Been getting a raw-hide, hey?' which, being interpreted, means, 'Ah, I observe you have recently purchased an animal unaccustomed to the work.'"

Follow this train over the hot, dreary waste it traverses and you will find no macadamized roadway, though in places the track is smooth and well beaten. At one point the route lies across the bed of a dry lake, whose lava-washed pavement seems like a huge mosaic, for the irregular, many colored stones are worn smooth upon the surface as if pressed into place by a huge roller and then polished. Again, the roadway lies through wonderful cañons, whose furrowed sides, perpendicular to a dizzy height, seem like the high walls and buttresses of a grand cathedral, or the frowning battlements of some mighty fortress.

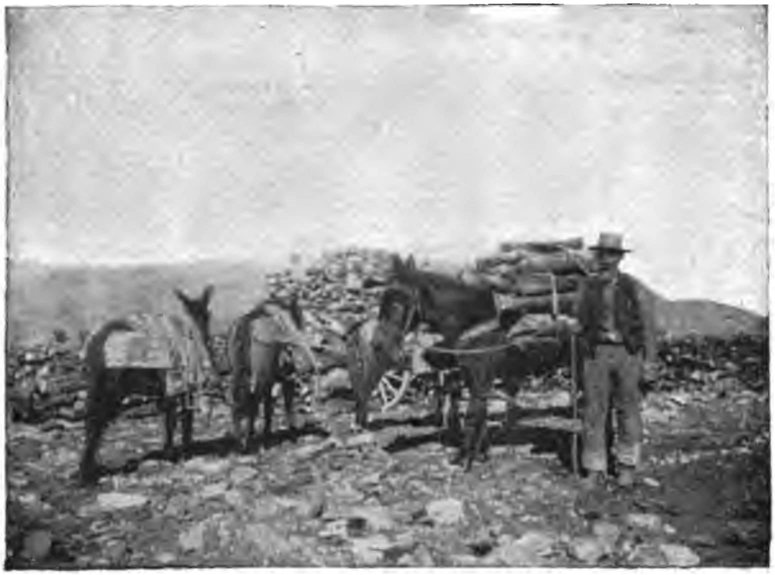
At points these jutting prominences stand out clear with a heavy covering of lava running down the sides like melted wax, while on top lie subsequent deposits of earth and sand. For many weary miles we follow the torturous wash or dry beds of ancient streams, over depths of sand and gravel and rugged boulders brought down by the occasional water spouts of the region above.

Save only an occasional lonely cactus, a few sage, mesquite and grease wood bushes, and the rarest little oases about the springs, it is indeed a skeleton land. The bare outline of mountain, valley and plain is there, whereon verdant fields might possibly be, but have not been builded. But the landscape is absolutely wanting in the charm of nature's filling in, of that detail which alone beautifies the picture. The beds of lake and stream are there, but no flowing waters. No verdure, no life. The few isolated plants are themselves leafless skeletons.

But as in colder climes nature forms her delicate tracing in the frost to compensate for verdure hidden, so here, in the absence of plant life whereon to paint the beauty of form and color, the very rocks and stones are variegated and many-hued, while deep within the rugged mountains are those richer crystal formations whose clearness, translucency and sparkling brightness attest the infinite skill which everywhere provides wondrous beauty of form. And besides these are found immense deposits



BORAX TEAM STARTING FROM DEATH VALLEY.



ANOTHER MODE OF TRANSPORTATION.

of borate of pure and useful qualities, adapted to a hundred uses in the household. The present borax deposit, it should be explained, is found in crystal veins of snowy rock, rich, pure and beautiful. One or two views along the road from Daggett to the Calico Borax Mine and on to Death Valley will give a faint idea of the rugged beauty of this barren land.

FINALE.

A PLAN FOR THE USE OF CONVICT LABOR.

By James N. Brewster.

ONE of the great questions of the present day is how to improve our public roads, and in its discussion we are often confronted by another, to wit, what is the best way of utilizing our prison labor so as not to come violently in contact with organized labor in any of the several branches of industrial pursuits.

JAMES N. BREWSTER.

A plan is here suggested for the solution of this second question and for the material advancement of the work contemplated by the first. Most country roads and many streets within the corporate bounds of cities and villages may be largely improved by the use of a material which can be produced by the employment of unskilled manual labor. I refer to the broken or crushed stone commonly employed in the making of Telford and Macadam roadways. Assuming, now, that many of our prisons are so situated as to be within accessible distance of good stone quarries (which is, in fact, the case), how can we employ our prison labor in the making and distribution of this road material so as to distribute the benefits equitably among the districts near and remote?

Of course a suitable plant for the economical production of good broken stone and its assortment into different sizes should be erected at the expense of the State, and good railway connection, together with a proper equipment of freight cars, must be provided to handle and deliver the material as fast as needed.

This being done, the question of distribution is next in order. The material having been produced at the expense of the State at large, an expense of which each town, near or remote, shares its burden according to the value of its property, it is manifestly proper that each town should receive the road material produced by prison labor at a cost equal, as nearly as possible, to that paid by other towns for similar benefits; for example, Montauk is 150 miles from Sing Sing prison, while the town of Sing Sing is, say, one mile; and if the cost of transportation by rail should amount to one cent per ton per mile and the cost of production of road material at the prison should be found to be one dollar per ton, it would be manifestly unfair to charge the Montauk consumers $2.50 per ton for material delivered at Montauk while the same material could be delivered at Sing Sing for less than half that sum. If, however, a uniform price of seventy-five cents per ton should be added to the cost of production ($1.00), thus requiring these two towns each to pay not the actual but the average cost of material as delivered at both places, a principle of equity would be followed in which the benefits and burdens would be justly bestowed and general satisfaction insured. In a similar way intermediate places could be served and the price made the same to all localities. I have used the illustration as an illustration merely. The perfection of the general plan of course involves extended and careful computation, so that an average might be determined which should be observed in fixing a uniform price for this material to consumers in all parts of the State.

But the question may arise, would not the indiscriminate distribution of road material in this manner induce some town officials to take advantage of terms which might be to them peculiarly favorable, by "laying in" an undue quantity of this material? The price of course would have to be pitched at a reasonably low price in order to secure its sale at all, and the suggestion that this price might be taken advantage of by the remote towns to the detriment of the towns near at hand may seem to be pertinent.

Of course it is always difficult and generally impossible to conduct public business with exact equity to all concerned, but I believe that a very simple provision might wholly insure the fair distribution of road material from prison centres without undue favor to any of the towns benefitted by its operation. It is this: Let record be made of the number of miles of public roads in each town (exclusive of streets of incorporated cities and villages), the number of inhabitants and the value of assessed taxable property. Upon the basis of one or more of these factors, as may seem best, let there be determined the number of tons of road material to which each town shall be entitled; it being, of course, optional with each town whether it shall receive and use any of the material thus set apart. This question being decided, the State authorities (or the authorities of each prison district) should cause a circular letter to be sent to the town clerk of each town, giving public notice that there will be held for a certain fixed period, subject to the order of that town, a certain number of tons of road material, stating the price thereof, and that if no answer or requisition is made for said material or any part of it, then the material not required shall not be available for the use of that town, but may be distributed by some equitable rule among such towns as have signified their need for greater quantities than those fixed by their regular allotments.

Besides the enormous advantages which the operation of this system would bring to the many towns that are now demanding improved roads, it would offer unquestioned advantages in the settlement of the prison labor question and operate strongly to the industrial benefit of the convicts employed. The variety of workmanship required to produce good road material would call into activity the trained and skilled convicts, and others would be educated to the accomplishment of work of which they have heretofore had little or no knowledge. This work would include the quarrying of stone, the care, management and erection of machinery, the making and repairing of cars, tools, etc., and the performance of other labor which has no relation to the employment of free citizens. In view of the lively interest now shown in the general movement for good roads, it is in no way likely that our prison labor would be able to supply a quantity of broken stone which should exceed the demand, while from a business point of view the profitable employment of this labor by the State would not only tend to largely wipe out the deficiency annually shown in our prison accounts, but a plan would be insured by which every town in line of railroad or canal communication would secure an excellent quality of road material at a less price than it could be obtained in the general market, and without investing in the purchase of expensive stone breakers and similar implements. Any method that can be put into practice by which our criminals may be usefully employed has a tendency to serve the community at large, and this is especially true if the method has the additional merit of teaching industry, manual skill and public economy. If it were also provided that each discharged convict should, as a reward for good conduct and industry, receive some substantial compensation to enable him to make a new start in life, there is little doubt that society would be benefitted both financially and morally. I am sometimes persuaded that a prison may safely be looked upon in most cases as a kind of hospital or asylum in which many inmates are afflicted by an inherited predisposition to crime, and whose prison life is largely the result of that unfortunate circumstance which we sometimes illustrate by saying that the free and rich unfortunate is born with a silver spoon in his mouth and his poor convict brother with a wooden ladle.

WE are not in possession of the fuller returns, which would enable us to say precisely in what proportion our towns absorb the population. In 1881, 44 per cent. of the people of England and Wales were living in towns; the chances are that the proportion is nearer 60 per cent. to-day. The village does not grow; year after year it stands changeless as its immemorial elms. In 1881, twelve great towns absorbed over six millions eight hundred thousand of people, or 26 per cent. of the total; ten years later we find that these same towns counted seven and a half millions of people, or about the same percentage. But, side by side with the steady growth of the new-old centres of industry—one or two of which, notably Liverpool, have slightly decreased in numbers—innumerable fresh wens have been shooting forth on the fair surface of English soil, with city suburbs, which in London run over three counties. Greater London, indeed, is a vastly bigger business than the London which counts in the registrar-general's return for paltry 4,200,000 folk as against 3,800,000 in 1881. In the end, we are doubtless tending to the Australian model of a national life concentrated in province-cities, the centres devoted to work, the population, as in unhealthful Eastern towns, spread loosely for sleeping quarters over countrified suburbs.—*London Speaker.*

THE COST OF HUMAN LABOR.

A FRENCH engineer, M. de Foville, who possesses a genius for analysis, has recently made a carefully prepared estimate of the cost of transportation in various parts of the world, taking into account the methods adopted for carrying on this form of human labor. In making a geographical division, he finds that on fully one-fifth of the land surface of the world the only means for the transportation of merchandise is on the backs or heads of human beings. In quite three-fifths of the remaining land surface, transportation is carried on by means of mules, horses, camels or oxen, without wheeled vehicles, and of the remaining one-fifth more than three-quarters of the transportation is carried on by the means of wagons, carts and other ordinary wheeled vehicles; while not more than one-twentieth of the habitable surface of the globe is supplied with railroad accommodations.

It will thus be seen from this that, though civilization has made great advances among a few favored races, its highest expression in the matter of transportation has been thus far limited to a small fraction of the earth's surface. M. de Foville goes still further, and estimates the cost of transportation by these various methods. The cost of carrying merchandise by human beings he states to be on the average three francs thirty-three centimes per ton per kilometer; on the back of mule, horse, camel, or ox, eighty-seven centimes per ton per kilometer; by wheeled vehicles twenty to twenty-five centimes per ton per kilometer; by steam railroad in France, six centimes, and in the United States less than two centimes per ton per kilometer.

The latter rate is an exceptionally low one, perhaps, even for the United States, applying, as it does, to the great trunk roads between the Atlantic seaboard and the Mississippi river. But, on the other hand, he shows that the carrying of merchandise by human beings in Central Africa involves a cost of ten francs per ton per kilometer, or five hundred times the cost of sending the same merchandise a like distance over one of our great trunk lines of railroad. Or, to state the matter in a different form, it cost Mr. Stanley in his expedition in Central Africa, to carry a ton of supplies one mile, as much as it would cost to send a ton of merchandise from Boston to Buffalo.

These figures are interesting as the result of a careful investigation into the methods and cost of transportation; but they have a value in another way which even M. de Foville does not seem to have thought of. All human effort in the so-called struggle for existence is limited to the movement of materials. We are accustomed to speak of the productive industry of a people, but, so far as the every-day work of man is concerned, nothing is actually produced. Nature supplies us with everything that we have, and human production, or human creation, consists simply in making a removal from one place to another, bringing two or more materials into conjunction with each other, removing substances which cover over or are mixed with the materials the use of which is desired, or causing changes in a material by bringing it under the influence of heat or chemical action. But in all of these processes the only act of the human being is that of movement, his hands, in lifting, carrying, selecting and arranging, obeying the direction of more or less trained intellect.

Now, the great industry of transportation, to which reference has been just made, is but one form of movement; but, so far as human production is concerned, it is no more distinctly movement than the work which is going on in a woolen factory or an iron foundry. In these cases, as in transportation, materials are merely moved. The wool is passed, either by hand or by machinery, through the process of scouring, spinning, weaving, dyeing and fulling, the human agency being confined to the work of moving it, or substances that are brought in contact or blended with it, at the proper time and in the right manner. Everything that is performed by machinery might be done by hand, only the process would be slower and the result more costly and less satisfactory. So, in the iron foundry, the iron is moved to bring it under the influence of heat; it is then taken away, and by various movements, either of hand or machinery, directed by hand, the desired results are brought about.

The art of moving materials is, therefore, the great and only means by which mankind supports itself, and civilization consists in a large degree of a knowledge of how to move, when to move, and what to move, and the ability to make these changes in materials at a small expenditure of human effort. We see that in the case of what is termed transportation, the cost of moving a ton of merchandise by the ignorant natives of Central Africa, who are probably paid for their services no more than a cent or two a day, is five hundred times greater than the cost of moving a similar quantity of merchandise by the highly paid labor of this country, with improved appliances. But contrasts almost, if not quite, as great could be made between the costs of carrying on the movements by which goods are manufactured.

The price of labor has nothing to do with the costs of these processes. One intelligent man, by the use of a hydraulic machine, can raise a weight which a thousand men lifting with their hands could not stir; hence, whether movement in manufacture is cheap or expensive will depend, not upon the wages paid, but on the quantity of the intellect applied to the work. Rates of transportation by rail are lower in the United States than in any other country in the world, simply because of our greater intelligence.—*Selected.*

AMERICAN machinery, American tools, American "notions" of many sorts, have long had a recognized place among us, but American road carriages are so very rarely seen in England that when one does appear it is the object of our curious interest. This interest and this curiosity are due to the lightness of their construction, in the first place, and, in the second, to their unfamiliar shapes. The buggy and the buckboard, the surrey and the platform spring wagon are almost as strange to the English eye as the heavy dog-cart to the American. But for comfort, for easy riding, for light draft and rapid driving there is nothing to compare with these American types in our English vehicles. Then, as to their apparent fragility, a well-made American wagon is, in spite of its light build, a model of strength. Roads that would speedily shake the heavy English-built vehicles to pieces, and too many American roads are of that description, would not start a bolt or a seam in these light, springy carriages. That is to say, in ordinary use, on average town and country roads anywhere, the lighter vehicle (always if well made), will outlast the heavier. For our smooth English roads American vehicles are so admirably suited that the wonder is the effort to introduce them has not long since been made. However, they have come at last, and we cannot doubt but they have come to stay and to make their way.—*The Ironmonger.*

DIRT ROADS AND GRAVEL ROADS.

By Isaac B. Potter.

VI.

(Continued.)

In the laying of pipe culverts and cross drains you will naturally seek to give to the bed of your channel a proper elevation and grade, but in spite of its importance this part of the work, if not wholly neglected, is often done in so hap-hazard and imperfect a way as to destroy, in a measure, the effectiveness of the drain. I do not now refer specially to the rate of "pitch" or fall of the drain from inlet to outlet, for that has already been referred to; but rather to the elevations of the two ends of the drain or culvert, as compared with the connecting channels from which it receives and into which it discharges its flow. The bottom of your drain at its outlet should be, if possible, slightly higher than the surface of the water into which it discharges, especially if the latter is found to be sluggish and likely to "back up" and fill your drain in times of freshet. If the flow is rapid and fairly continuous this precaution is not so imperative; but in all cases it is best to examine the outlet stream for a good distance beyond the discharging end of your drain, and to be sure that the water which passes through your drain will quickly find its way to other localities. At the upstream end a contrary rule must be adopted, for here you invite the flow of water and must accordingly, if possible, place the bottom of your drain fully as low as the bottom of the inlet channel, first clearing out the latter and making sure that it is not clogged or raised by deposits or obstructions. The water in the inlet channel should flow freely and by an easy grade towards the culvert or drain and the latter should be made sufficient, both in grade and capacity, to carry all the water which the inlet channel will hold in the wettest season. Of course, it is not always possible to follow these directions with strictness. It will sometimes happen that the flatness of the adjacent country will forbid the rapid flow of water in surface drains, and in such situations your roadway embankment is likely to hold back the water upon one side or the other and perhaps to cause the accumulation of sluggish ponds and water holes; but these will do no special harm to your roadway if the latter is raised to a good height above the original surface of the ground, in which case it will not be necessary to have the inlet end of your cross drain as low as the bottom of the inlet channel, but it should be raised in this case to such height as will give the drain an ample grade downward toward the outlet, keeping the latter high enough to prevent the setting back of water from the outlet channel into the drain. No written instructions can be given that will cover all the separate problems of drainage which present themselves for the roadmaker's solution; but close observation and a little study of the subject as your work progresses will determine the best way in each particular case.

A final word regarding the use of vitrified clay pipe for cross drains. The "crockery" nature of this pipe has caused some reluctance on the part of roadmakers to adopt its use. This pipe is sometimes broken by severe shocks and blows, but rarely by mere pressure, and if properly laid it may be safely used under the heaviest embankments, and at a great saving of cost when compared with more pretentious, though oft-time not more permanent or useful, culverts of masonry. It should, however, be always covered by an ample depth of earth, and where the road is likely to be subjected to heavy traffic, this depth could not be less than two and a half to three feet. For your information I have decided to include here a statement of test made by Andrew Rosewater, civil engineer, of Omaha, Neb., for the purpose of determining the strength of culvert pipe by the application of forces to both the interior and exterior of the pipes. Upon the application of hydraulic pressure to the interior of the pipes, the "breaking pressures" for the several sizes of pipes were found to be as follows:

6 inch breaking at 200 pounds to square inch.
9 inch breaking at 180 pounds to square inch.
12 inch breaking at 160 pounds to square inch.
15 inch breaking at 150 pounds to square inch.
18 inch breaking at 140 pounds to square inch.
20 inch breaking at 110 pounds to square inch.
21 inch breaking at 100 pounds to square inch.
24 inch breaking at 90 pounds to square inch.

Pipes of the same sizes were also broken by the application of external pressure exerted by means of a simple apparatus consisting of two wooden blocks which were cut to fit the top and bottom exterior surfaces of the pipe, leaving the sides unsupported, as shown in Fig. 20. A powerful lever was provided by placing one end in a stirrup having a bearing point about one foot from the centre of the pipe while the weight was applied to the other end of the lever, which was twenty feet long. The pressure was applied at the top of the pipe with the following results, the figures in each case indicating the average between two pieces of pipe of each size, each piece being twenty-four inches in length. The samples all failed by cracking through the sides and centre, somewhat after the manner that arches fail under similar conditions and as shown by the irregular white lines in the figure:

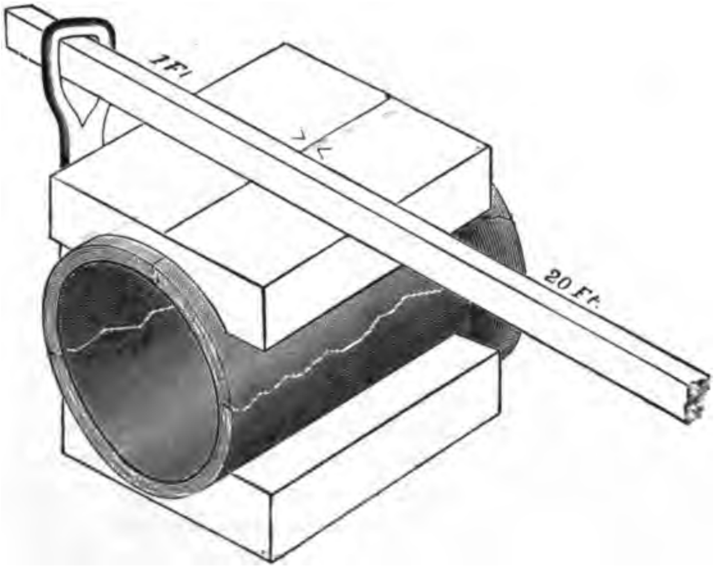


FIG. 20. SHOWING METHOD OF TESTING STRENGTH OF VITRIFIED PIPE.

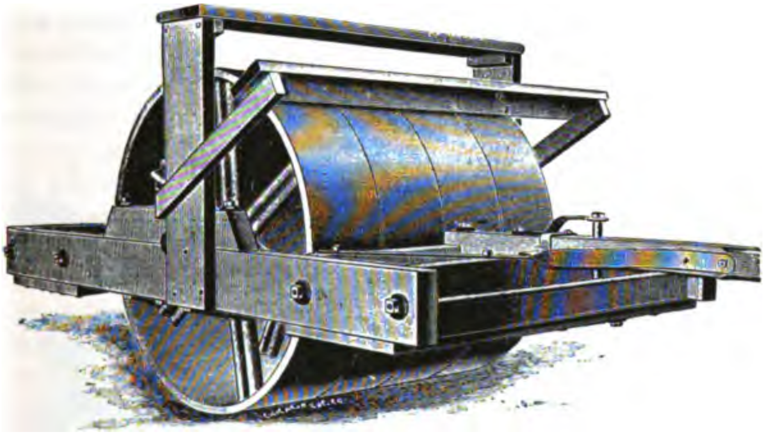
DIAMETER.	THICKNESS.	CRUSHED AT LBS.
6 in.	¾ in.	40,190
9 in.	⅞ in.	38,760
12 in.	1 in.	35,250
15 in.	1¼ in.	33,030
18 in.	1½ in.	30,100
20 in.	1⅝ in.	28,240
21 in.	1¾ in.	26,900
24 in.	2 in.	25,025

Laying Tiles.—In a former chapter I have recommended the use of tile drains and have set forth at some length a statement of my reasons why they should be used. There is some variety of opinion regarding the best methods of road drainage and of the use of drain tile in other situations; but, without attempting to discuss the relative merits of different methods, I will say that the worst system is better than none and that the main objects to be accomplished in tiling a road are to get the water into the drain and out of it as rapidly as possible. Accordingly, if you adopt the centre drain, as I have recommended, do not cover your tiles with closely packing or adhesive earth, but restrict yourself to the use of coarse, porous material, such as clean gravel, field stones, etc., laid in the manner suggested in Chapter III. I urge this upon you because the use of clay, clayey gravel or similar material over your line of tiling will result in the "puddling" of the roadway and prevent the passage of surface water into the pipe. Another precaution which you must observe is to avoid laying tile near trees and large plants which have a strong affinity for water, as the neglect of this will result in the filling and eventual stoppage of your tile channel by the fine roots, as has been frequently the case where tiles have been laid near willows and other water-loving plants. In laying tile do not open too great a length of ditch before beginning to put in your pipe, but let the latter follow the work of ditching quite closely; otherwise a treacherous material in the sides of your ditch, or the falling of a heavy shower upon even a moderately firm material is apt to produce a sloughing or caving in of your ditch, thus undoing your work and causing extra trouble and expense.

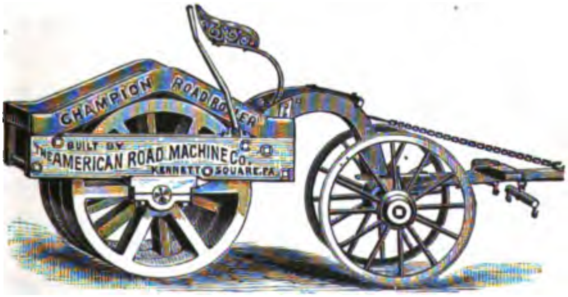
Rolling.—Let us suppose that your drains have been put in, culverts laid, banks sloped and your road surface given its proper shape. It is by no means a finished road even now, for in many parts your earth will be loosely compacted and in others scarcely settled at all. Rains will wash it, wagon wheels will sink into the surface and in a short time your earth will settle unevenly and take on a shape that will make you look upon it as a mortifying failure. You may obviate many if not all of these bad results by the thorough and proper use of a good roller. Every dirt road that is subjected to wagon traffic becomes hard by the process of rolling. Every wagon wheel acts as a roller, and when you consider the millions of wagons in use, you may see the force of my statement when I tell you that if wagon tires were made of a width fairly proportioned to the heavy loads which they are required to sustain, our country roads would be vastly smoother and always in better condition than we find them to-day. If you have ever seen a ponderous fifteen ton steam roller at work you have been impressed with its great weight and perhaps pleased to note how quickly and easily it hardens the road surface over which it is rolled and how smooth and inviting the road surface appears after the roller has completed its work. If you are not fully informed you are apt to believe that the hardening of the surface is due solely to the great weight of the roller, but in this you are mistaken, as you may easily prove by hauling a heavily loaded wagon having narrow wheel tires over the surface which has already been rolled and hardened by the steam roller. You will find that the wheel tires of the wagon will impress the surface of the road, causing a slight rut of greater or less depth (depending somewhat upon the nature of the material in the road surface), thus showing not only that the weight per square inch upon the tires of the loaded wagon is greater than that upon the face of the rollers, but that the weight sustained by the narrow wheel tires is much too great for the good of the road, or that the wheel tires are much too narrow to sustain the weight of the load, the latter being the almost uniform rule in the use of American farm wagons.

You are familiar with the soft and cloggy condition of the ordinary country road in spring-time, and know how the summer sun gradually evaporates the water and leaves the road surface roughened and cut by deep ruts and marred by occasional mud holes where the deep water has not fully evaporated. To hasten the escape of the water I have advised thorough drainage, but to destroy ruts and preserve the road surface in good passable condition rolling should be resorted to and the more constant your rolling, the smoother and more satisfactory will your road become.

Horse rollers are largely used on country roads and some of them may be made to do very fair work, but it is now generally conceded that for heavy rolling where great solidity and uniformity of work are required, the steam roller is the best and cheapest. Unless your dirt road is located in close proximity to Macadam or Telford roadways where steam rollers are generally employed for construction and repairs, you are not likely to have the use of one of these machines in the improvement of your dirt road and you will therefore be more likely to adopt a horse roller. Horse rollers may be obtained of any weight from one to eight tons or more, the prices varying with different manufacturers, the average list price being a little less than $100 per ton. The makers of horse rollers claim certain advantages for their machine over the steam roller, among which may be enumerated the saving of first cost, the cost of operation, a superior adaptation of the horse roller for rolling earth foundations, less liability to frighten horses, larger diameter of roller, which tends to compact the



HORSE ROLLER. (GATES IRON WORKS, CHICAGO, ILL.)



HORSE ROLLER. (AMERICAN ROAD MACHINE COMPANY, KENNETT SQUARE, PA.)

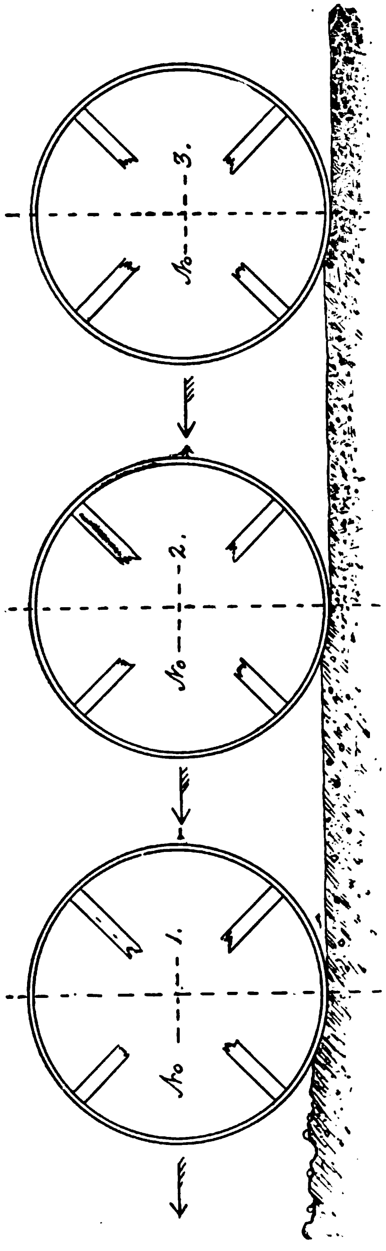
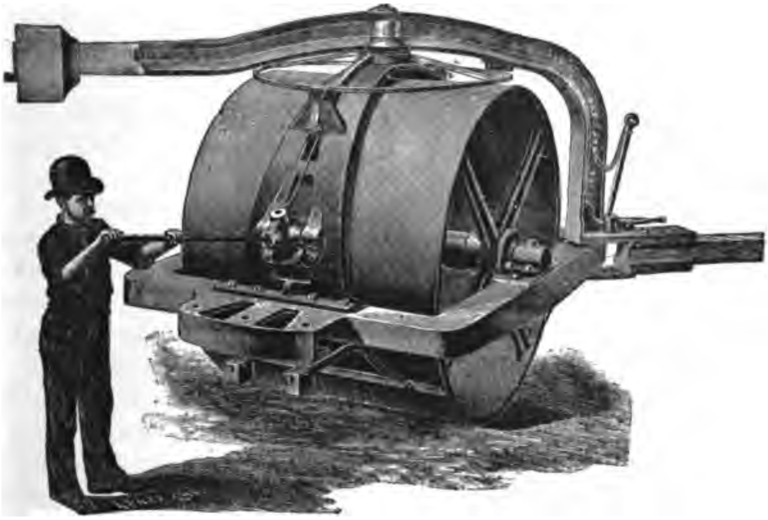


FIG. 21. SHOWING ACTION OF ROLLER ON EARTH ROADWAY SURFACE.

material rather than to push it ahead, less liability to crush soft stones and less difficulty in mounting steep grades of coarse, broken stone than when steam rollers are used. I am not disposed to concede all these points of superiority, though for many situations, especially where the question of first cost is a serious one, the horse roller may be used to immense advantage. These rollers, while alike in the one essential feature which demands a heavy roller of good diameter and broad face, differ somewhat in the method of detail construction, though most of them have stood the test of experience and may be recommended.

In preparing your road surface for the roller, remember that the heavy roller will harden and consolidate the surface, and that the finished grade, when left by the roller, will not only be smoother and harder, but also somewhat lower than was the original surface of the road before the roller was applied. This will be understood by reference to Fig. 21, in which the three rollers may be assumed to be passing in the direction indicated by the arrows. The passage of roller No. 1 pulverizes the lumps of earth and smooths and consolidates the surface, while the passage of roller No. 2 still further hardens and lowers the road surface, and again, roller No. 3, passing over the same course, increases the hardening and smoothing effect and leaves behind it a compressed surface considerably lower than the ground immediately in advance of roller No. 1. In making allowance for this packing and lowering of the surface, it is generally necessary either to raise the unrolled surface to a height somewhat above that of the finished grade or to add new material to the surface during the process of rolling. A "reversible" horse roller, invented by R. C. Pope, of St. Louis, and said to give excellent results in all kinds of construction, is offered for sale by the F. C. Austin Manufacturing Company, of Chicago. It is so made as to permit the reversing of the tongue which swings about a pivot arranged at the top of the machine, thus enabling the operator to haul the roller in opposite directions without subjecting the surface of the ground to the grinding and "tearing up" effect which is so often seen where the heavy roller itself is turned around. Good horse rollers are also made by the Gates Iron Works, of Chicago, and American Road Machine Company, at Kennett Square, Pa.



REVERSIBLE ROAD ROLLER. (F. C. AUSTIN MANUFACTURING COMPANY, CHICAGO, ILL.

Weight of Rollers.—Great differences of opinion exist regarding the proper weight of roller to be used in the different kinds of road-making, but it is reasonably well settled that a roller of any given weight cannot be used to the same advantage on all kinds of roads, and that the weight of the roller in each case should, if possible, be adjusted to answer the condition presented. A comparatively light roller of large diameter may be used to advantage where the ground is soft and yielding, but the same roller would hardly answer to consolidate heavy and moderately firm materials. It is therefore best, when possible, to use a roller which may be loaded and lightened at will, to answer these several conditions, remembering, however, that the final work of the roller can hardly be done by too heavy a machine, and that the process of rolling is more likely to be discontinued too quickly than unduly prolonged, which latter is indeed hardly possible in ordinary conditions.

Wheel Tires.—It is idle to undertake the maintenance of a dirt road in good repair while it is subjected to the cutting and grinding effect of heavy loads hauled on narrow wheeled vehicles. No matter with what care your road may have been originally constructed and rolled to a compact surface, rains will soften it and narrow wheel tires will hasten the work of destruction so as to quickly efface the good effects of your labor and impede the passage of traffic. Nothing could be more costly and nothing more ridiculous than the custom followed by American farmers and merchants who, for the last hundred years, have been loading their produce and merchandise, often to the amount of one ton and upwards on each wheel, and hauling these loads about over our dirt roads on two and one-half inch wheel tires. Use, observation and the most careful experiments have combined to prove that wheels with two and one-half inch tires produce more than double the wear on a road that wheels with four and one-half inch tires would cause. The wide tires tend to roll the road and keep it smooth and passable, while the narrow ones cut and destroy even the best roads and increase the dangers and difficulties, besides adding to the expense of hauling upon whatever kind of vehicles used.

Another advantage of wide tires is that under many conditions the wide tired vehicle may be hauled with a less expenditure of force than the narrow tired one. You know that much time is frequently lost by the farmer who is unable to hasten his Spring work in the field because the wet condition of the ground forbids the use of a wagon on cultivated land. The use of wide tires on his wagon wheel will generally enable him to take up this work much earlier and to perform it more quickly and cheaply than can be done with his narrow wheeled wagon. In fixing the width of wheel tires so as to be properly proportioned to the weights of the different loads which they are designed to carry, I would recommend the following dimensions:

LOAD ON EACH WHEEL.	WAGON WITHOUT SPRINGS.	WAGON WITH SPRINGS.
1,000 to 1,500 pounds.	4 inches.	2½ inches.
1,500 to 2,000 "	5 "	3½ "
2,000 to 3,000 "	6 "	4 "

I am aware that other writers have advised the use of wheel tires somewhat narrower than the dimensions I have given, but I am compelled by both observation and experience to differ from some of the learned authorities in this matter and can hardly bring myself to believe that a one inch tire on a four-wheeled spring wagon is of sufficient width

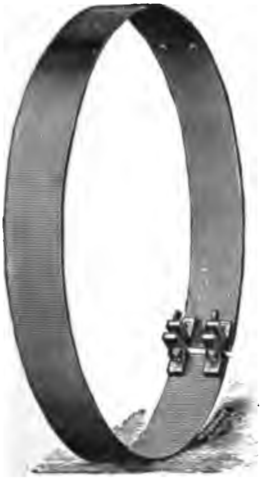


FIG. 22. ADJUSTABLE WIDE TIRE FOR WAGONS.

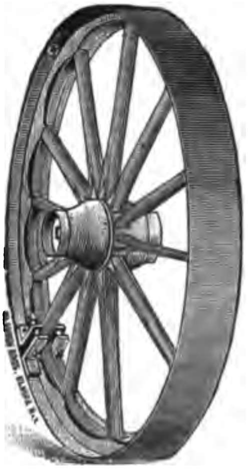


FIG. 23. WHEEL WITH ADJUSTABLE WIDE TIRE.

to properly maintain a load of three tons, notwithstanding the opinions of these gentlemen to the contrary.

Forseeing the objection which might be raised to the great cost of supplying vehicles now in use with wide tired wheels, an ingenious inventor has placed upon the market an adjustable wide tire which may be made of any desired width and so constructed as to fit any of the wagon wheels now in common use. Fig. 22 represents the general appearance of the tire before being applied to the wheel, 'and Fig. 23 shows the wheel of an ordinary farm wagon with the adjustable tire fixed in place. These tires are made by the Richardson Manufacturing Company, at Bath, N. Y. Both iron and steel are used in their construction (as may be desired by the purchaser), and they seem to have given much satisfaction during the brief time they have been in the market.

VITRIFIED BRICK PAVEMENT.

SPECIFICATIONS FOR WORK AT DUNKIRK, N. Y.*

Preparation of the Roadbed.—All grading must be done in strict accordance with the lines, levels and plans furnished by the City Engineer.

Cross Section of Roadway.—The transverse section of the finished pavement will be a segment of a circle; the centre shall be ten (10) inches higher than the lowest point of the gutter as shown on the plan.

Depth of Roadway.—The roadway for its entire width (except as hereinafter provided in case of street railroad tracks) is to be graded to such a depth that when properly shaped and rolled, it shall be at all points not less than eleven and one-half (11½) inches below the established grade of the street or avenue, said grade to be determined by stakes set by the engineer.

At all intersecting streets, avenues or alleys, the work of grading and paving shall be extended to the line of cross-walks crossing such intersecting streets.

Objectionable Material to be Removed.—If any spongy, vegetable or other objectionable material be found in preparing the roadbed, it shall be removed, and the space so excavated shall be filled with clean gravel, or other suitable material, carefully and thoroughly tamped or rolled, so as to make such filling compact and solid and at the grade above mentioned.

Shaping and Rolling.—The roadbed shall be truly shaped, and rolled to the required grade and crown as shown on the plan of the work, with a roller weighing not less than five tons or one hundred and seventy (170) pounds per lineal inch of length, until the surface is firm and compact; if the material now in the avenue or any part thereof will not admit of satisfactory rolling, such material must be removed by and at the expense of the contractor, and proper material substituted therefor. No ploughing will be allowed within three (3) inches of the sub-grade.

Filling.—In all places where filling may be required to bring the surface to the required sub-grade, it shall be done in layers not to exceed nine (9) inches in depth, and shall be thoroughly tamped or rolled as may be required to secure a solid roadbed, but no payment shall be made for said filling.

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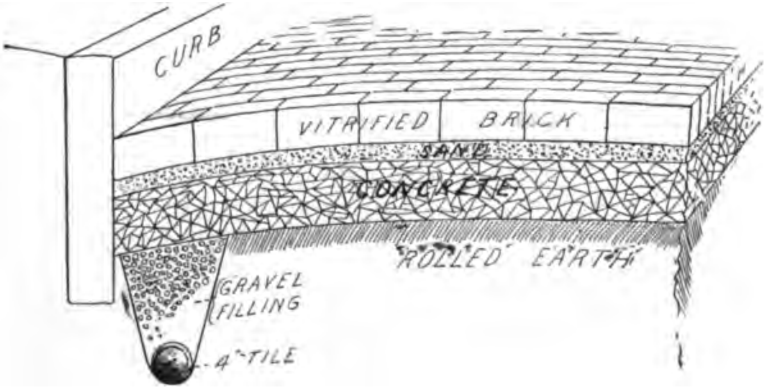
*By F. A. Dunham, C. E.

Surplus Earth.—All surplus earth taken from the street, after all of the necessary filling has been made, shall be the property of the contractor, and shall be removed by him from the work.

Whenever it is found necessary to raise or lower the top of any manhole or receiving basin, or any other fixture owned by the city, in the line of said work, the contractor shall make the change necessary to bring such fixture to the proper grade at his own cost and expense.



SECTION AND VIEW SHOWING BRICK PAVEMENT ON CONCRETE FOUNDATION, WITH UNDER DRAIN AT GUTTER.

When necessary to raise or lower manhole and basin heads, the manholes and basins shall be brought to the required height with brick masonry of the same thickness as that on which it rests, and in all respects to the satisfaction of the engineer.

Under Drains.—Under drains shall be laid under each gutter where required by the engineer, and shall consist of four (4) inch drain tile, laid with open joints and at such distance from the curb line as may be directed by the engineer.

The top of said tile to be twelve (12) inches below the sub-grade of the gutter, and the trench above the pipe to be filled with coarse gravel to the height of the sub-grade and thoroughly rammed.

The price per lineal foot to include the trenching, the laying of the pipe and the covering of gravel, and making the necessary connections with the receiving basins, sewers or drains.

Concrete Foundation.—After the roadbed has been prepared to the satisfaction of the engineer, a concrete foundation made as specified below shall be laid.

The concrete shall be made in the proportion of one part of American hydraulic cement to two parts of clean, sharp sand, and such a quantity of broken stone or clean screened gravel that the mortar shall fill all voids in the same, and flush to the surface when rammed. The cement shall be fresh and finely ground; it shall be subject to such tests for fineness, tensile and crushing strength, and liability to check or crack, as the engineer may require.

The stone shall not be larger than will pass in any direction through a two inch ring.

The sand and cement shall first be thoroughly mixed dry until every particle is coated with cement and then made into a mortar with the least possible amount of water; to this shall be added three parts of clean beach gravel, the same to be thoroughly wet before being added to the mortar. The whole mass shall then be thoroughly mixed, and then deposited on the roadbed to such a depth that when thoroughly settled and set it shall measure six inches in depth, and shall be rammed with wooden rammers, until the mortar flushes to the surface. If the engineer shall so direct, the gravel, sand and cement (in the above proportions) shall first be thoroughly mixed dry, and the water added gradually while the mass is being turned with shovels. The amount of water added must not be sufficient to show free on the surface.

No mortar or concrete shall be mixed on the ground, but the contractor shall provide a suitable board for the purpose, to be used upon the sub-grade.

The sand and gravel may be obtained by the contractor free of cost from property owned by the City of Dunkirk, but said materials will require to be separated by screening.

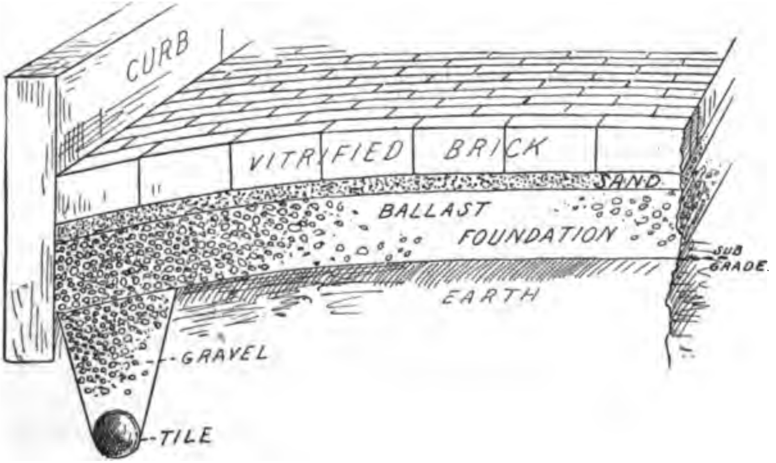
No batch of concrete containing more mortar than will be made from one barrel of cement shall be mixed in one batch.

No mortar or concrete shall be used or worked after it has begun to set, and after it is in place, all working, wheeling and walking over it must be prevented until it is sufficiently set.

If necessary, during the process of setting, the concrete shall be protected from the sun, and should the moisture in the concrete evaporate too quickly on account of the dryness of the weather, water shall be applied in such manner as to insure a slow and perfect set of the cement.

The City will supply water at hydrants free of cost to the contractor.

Ballast Foundation.—Contractors will also state in their proposals the price per square yard for pavement with ballast foundation prepared as follows:



BRICK PAVEMENT ON SAND CUSHION AND BALLAST FOUNDATION, WITH UNDER DRAIN AT GUTTER.

Upon the sub-grade prepared as before specified, a bed of ballasting of broken stone or coarse beach gravel, the size of which shall not exceed two inches in any direction, shall be placed to a depth of eight (8) inches, in two layers, each layer to be blinded with coarse gravel and well watered and rolled with a roller weighing not less than five tons until the engineer shall be satisfied that the materials have been thoroughly bonded.

Should the rolling cause any depressions, more stones and gravel shall be applied and the watering and rolling continued until the whole roadbed is brought to the proper grade and is made hard and compact.

Sand Cushion.—Upon the ballast foundation so prepared, a layer of clean sand shall be spread to a uniform depth of not less than one and one-half (1½) inches.

BRICK PAVEMENT.

The brick pavement shall consist of a first quality of sound, vitrified fire-clay paving brick, made and burned specially for street paving purposes.

Shape.—They shall be thoroughly vitrified throughout, regular in shape of uniform size, not less than 8 in. by 4 in. by 2½ in., free from flaws, cracks or breaks, and equal in all respects to samples that have been deposited by each bidder in the office of the engineer. The brick to be used on the contract shall be equal in quality to the brick known as the Brady's Run Fire Clay Paving Brick or the Park Fire Clay Paving Brick.

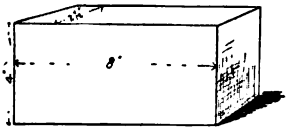


FIGURE SHOWING DIMENSIONS OF BRICK.

Inspection.—All material hauled on the work for the construction of the pavement shall be subject to inspection by the engineer or his agents; the bricks shall be culled before being laid and the contractor shall furnish men to assist the engineer or his agents in the work of inspecting the same.

Broken Brick.—No bats or broken bricks are to be used except at the curbs or street car rails, where bricks properly cut shall be used to break joints.

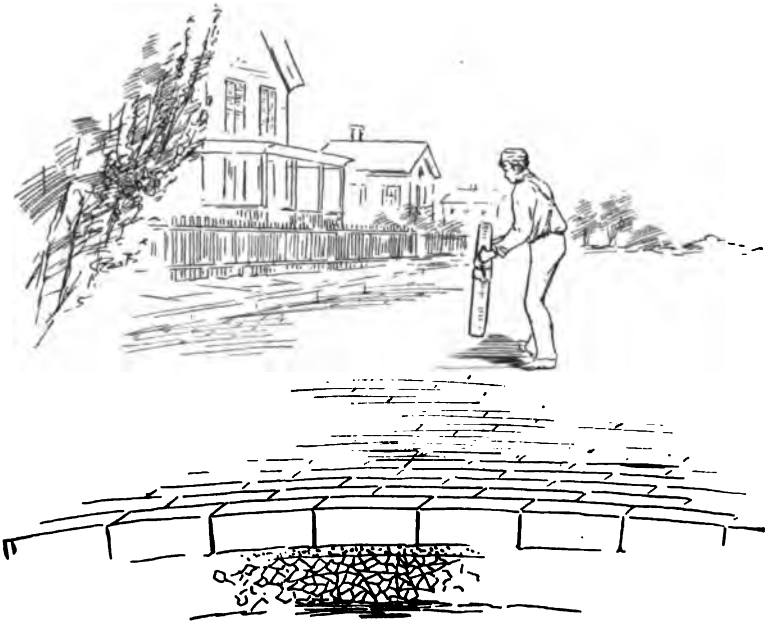
Trimming.—Care shall be used in breaking and trimming bricks for this purpose, so as not to check or break the part to be laid; the work must be done by competent men with proper tools.

Laying the Brick.—The bricks are to be laid on edges on the sand cushion before described, in straight lines with the longest axis at right angles with the curb lines, except at street intersections, where they are to be laid at such an angle with the line of the street as may be directed by the engineer. The brick shall be laid perpendicular to the grade and crown of the street, and the brick in each course shall break joints with those in adjoining courses at least three (3) inches.

Keying the Courses.—Before the closing brick in each course is laid, the bricks in said course shall be pressed as compactly together as possible with a bar applied at the end of the course;

a key brick shall then be cut to closely fit the remaining space, and properly key the course.

Joints.—The side joints, or joints between courses, shall not exceed one-quarter (¼) inch in width.



RAMMING THE PAVEMENT WITH SEVENTY-FIVE POUND HAMMER.

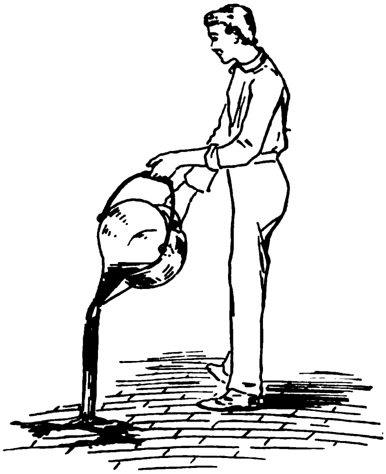
Ramming and Rolling.—The paving is then to be thoroughly rammed with a paving rammer weighing not less than seventy-five (75) pounds; said ramming to be done, if required, upon a two (2) inch plank moved successively over the entire surface of the pavement.

After a sufficient length of the pavement has been laid and rammed as above specified, it shall be rolled with a roller before described, if required by the engineer, until the pavement has been sufficiently consolidated and brought to the proper grade and surface.

Any bricks broken in laying, ramming or rolling must be removed and whole ones inserted in their place and thoroughly rammed into position.

Cement Grouting.—The joints between the bricks shall be filled with cement grouting, mixed and applied as follows:

Four (4) parts of hydraulic cement shall be added to one part of fresh English or Saylor's American Portland cement, the ingredients to be three times turned dry, then water to be added slowly and the turning continued until the grout has been thoroughly mixed and moistened.



FILLING JOINTS WITH CEMENT GROUT.

The pavement shall then be wet with water so that the grout will run freely in the joints, and the same shall be filled with the cement grout until it remains flush with the upper surface of the pavement.

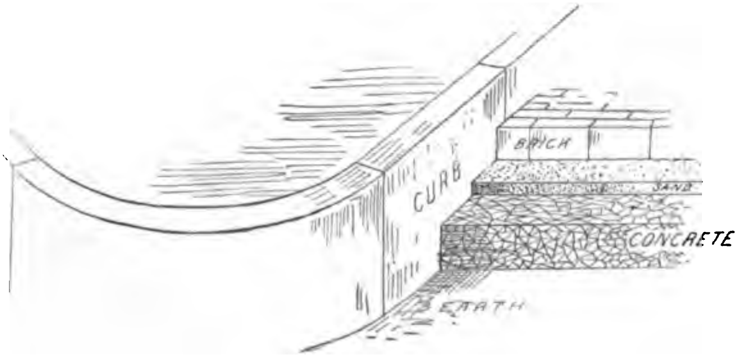
Rammers shall then be immediately used to bring the pavement to an even surface and solid bearing.

Top Dressing.—As soon as the joints between the bricks have been thoroughly filled with the liquid cement, a sprinkling of sand shall be spread evenly over the part grouted, and swept into the joints as directed by the engineer.

APPLYING THE TOP DRESSING.

Paving by Street Railway Company.—If any street railway company elects to do the paving between the railroad tracks, and for a space of one foot on each side thereof (as provided for in the amendment to the City Charter, made February 18, 1891), the contractor shall only pave the remaining part of the roadway.

Curbing.—All curbing shall be of a good quality of sandstone, equal to what is known as Berea sandstone, acceptable to engineer. The stone to be five (5) inches in thickness, not less than eighteen (18) inches in depth, nor less than thirty-six (36) inches in length, with a bevel of one-half (½) inch on top. The edges and face of all curbing to be dressed smooth and true to a depth of twelve (12) inches below the top. All curbing shall be of uniform thickness and free from seams. All joints to be made close fitting and not to exceed one-quarter (¼) inch for at least a depth of twelve (12) inches below the top. The curbing shall be set on not less than eight (8) inches and backed up with not less than eight (8) inches of sand. They must be settled to grade by means of a light curbing pounder and thoroughly and solidly tamped and left true for line and grade as given by the engineer.



VIEW AT STREET CORNER SHOWING CONCRETE, SAND CUSHION, BRICK PAVEMENT AND CURVED CURBING.

Curbing cut to a radius of two (2) feet shall be used at such street corners and driveways as may be directed by the engineer. All of the present curbing which shall, in the opinion of the engineer, require to be taken up and reset, shall be set as above specified for new curbing.

All new curbing, including corners and curbing reset, shall be measured by the actual lineal feet along their outer and upper edges. All grading necessary for the setting of the curb will be done by the contractor, and the cost of same shall be included in the price per lineal foot for curbs.

Wherever on the line of the work a fill is necessary to be made to bring the avenue to the required grade, a shoulder or support to the curbing in the line of the sidewalk shall be built of good hard material satisfactory to the engineer, said shoulder to be not less than three (3) feet in width and to the required grade, the cost of said shoulder to be included in the price bid for curbing.

Stone Cross-walks.—If required, cross-walks shall be furnished and laid, of the best quality Medina sandstone, not less than five (5) inches thick, eighteen (18) inches wide and not less than three (3) feet nor more than six (6) feet long. They shall be laid in two rows about twelve (12) inches apart in the clear, and the intervening space paved with Medina sandstone blocks as directed by the engineer.

The upper surface of the stone shall show no greater inequality than one-quarter (¼) inch, and shall be, when laid, one-half (½) inch above the finished surface of the adjoining pavement. The ends of the stones shall be squared and dressed so as to form joints not to exceed one-quarter (¼) inch in width to their full depth. The crossing stones shall be thoroughly bedded in clean sand, and the foundation of the pavement shall be extended under said cross-walks.

All cross-walks which shall require to be taken up and relaid shall be laid as above specified.

In case engineer in charge decides to have the cross-walks formed by the pavement, the contractor shall form the same to such grade and section as the engineer may designate, at the contract price per square yard for pavement.

"I THINK I am getting along," remarked the reformed reformer. "I wrestled with myself for three years and learned to keep my word; five years more of hard fighting enabled me to keep my temper, and I have been at it two years now, and hope soon to learn how to keep a lead pencil during business hours."

A FAMOUS GHOST STORY.*

(*Continued.*)

I RETURNED to my room, shut and locked the door that opened upon the interior one, and stood on the hearth, expectant and prepared. I now preceived that the dog had slunk into an angle of the wall, and was pressing himself close against it, as if literally striving to force his way into it. I approached the animal and spoke to it; the poor brute was evidently beside itself with terror. It showed all its teeth, the saliva dropping from its jaws, and it would certainly have bitten me if I had touched it. It did not seem to recognize me. Whoever has seen at the Zoological Gardens a rabbit fascinated by a serpent, cowering in a corner, may form some idea of the anguish which the dog exhibited. Finding all efforts to soothe the animal in vain, and fearing that his bite might be as venomous in that state as in the madness of hydrophobia, I left him alone, placed my weapons on the table, seated myself and recommenced my Macaulay. Perhaps, in order not to appear seeking credit for a courage, or rather a coolness, which the reader may conceive I exaggerate, I may be pardoned if I pause to indulge in one or two egotistical remarks.

"I PLACED MY WEAPONS ON THE TABLE AND SEATED MYSELF."

As I hold presence of mind, or what is called courage, to be precisely proportioned to familiarity with the circumstances that lead to it, so I should say that I had been long sufficiently familiar with all experiments that appertain to the marvellous. I had witnessed many very extraordinary phenomena that would be either totally disbelieved if I stated them, or ascribed to supernatural agencies. Now, my theory is that the supernatural is the impossible, and that what is called supernatural is only a something in the laws of nature of which we have been hitherto ignorant. Therefore, if a ghost rise before me, I have not the right to say, "So, then, the supernatural is possible," but rather, "So, then, the apparition of a ghost is, contrary to received opinion, within the laws of nature—*i. e.*, not supernatural."

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*"The House and the Brain." By Edward George Bulwer: Lord Lytton.

Now, in all that I had hitherto witnessed, and, indeed, in all the wonders which the amateurs of mystery in our age record as facts, a material living agency is always required.

On the Continent, you will find still magicians who assert that they can raise spirits. Assume for the moment that they assert truly, still the living material form of the magician is present; and he is the material agency by which, from some constitutional peculiarities, certain strange phenomena are represented to your natural senses.

Accept, again, as truthful the tales of spirit manifestation in America—musical or other sounds—writings on paper, produced by no discernible hand—articles of furniture moved without apparent human agency—or the actual sight and touch of hands, to which no bodies seem to belong—still there must be found the *medium* or living being, with constitutional peculiarities capable of obtaining these signs. In fine, in all such marvels, supposing even that there is no imposture, there must be a human being like ourselves, by whom, or through whom, the effects presented to human beings are produced. It is so with the now familiar phenomena of mesmerism or electro-biology; the mind of the person operated on is affected through a material living agent. Nor supposing it true that a mesmerized patient can respond to the will or passes of a mesmerizer a hundred miles distant, is the response less occasioned by a material being; it may be through a material fluid—call it electric, call it odic, call it what you will—which has the power of traversing space and passing obstacles, that the material effect is communicated from one to the other. Hence all that I had hitherto witnessed, or expected to witness, in this strange house, I believed to be occasioned through some agency or medium as mortal as myself; and this idea necessarily prevented the awe with which those who regard as supernatural things that are not within the ordinary operation of nature, might have been impressed by the adventures of that memorable night.

As, then, it was my conjecture that all that was presented, or would be presented, to my senses, must originate in some human being gifted by constitution with the power so to present them, and having some motive so to do, I felt an interest in my theory which, in its way, was rather philosophical than superstitious. And I can sincerely say that I was in as tranquil a temper for observation as any practical experimentalist could be in awaiting the effects of some rare, though perhaps perilous, chemical combination. Of course, the more I kept my mind detached from fancy, the more the temper fitted for observation would be obtained; and I therefore riveted eye and thought on the strong daylight sense in the page of my Macaulay.

"SOMETHING INTERPOSED BETWEEN THE PAGE AND THE LIGHT."

I now became aware that something interposed between the page and the light—the page was overshadowed; I looked up, and I saw what I shall find it very difficult, perhaps impossible, to describe.

It was a darkness shaping itself forth from the air in very undefined outline. I cannot say it was of a human form, and yet it had more resemblance to a human form, or rather shadow, than to anything else. As it stood, wholly apart and distinct from the air and the light around it, its dimensions seemed gigantic, the summit nearly touching the ceiling. While I gazed, a feeling of intense cold seized me. An iceberg before me could not more have chilled me; nor could the cold of an iceberg have been more purely physical. I felt convinced that it was not the cold caused by fear. As I continued to gaze, I thought—but this I cannot say with precision—that I distinguished two eyes looking down on me from the height. One moment I fancied that I distinguished them clearly, the next they seemed gone; but still two rays of a pale-blue light frequently shot through the darkness, as from the height on which I half believed, half doubted, that I had encountered the eyes.

I strove to speak—my voice utterly failed me; I could only think to myself, "Is this fear? it is *not* fear!" I strove to rise —in vain; I felt as if weighed down by an irresistible force. Indeed, my impression was that of an immense and overwhelming power opposed to my volition; that sense of utter inadequacy to cope with a force beyond man's, which one may feel *physically* in a storm at sea, in a conflagration, or when confronting some terrible wild beast, or rather, perhaps, the shark of the ocean, I felt *morally*. Opposed to my will was another will, as far superior to its strength as storm and fire are superior in material force to the force of man.

"I RECEIVED A STRANGE SHOCK, AND MY ARM FELL TO MY SIDE, POWERLESS."

And now, as this impression grew on me—now came, at last, horror—horror to a degree that no words can convey. Still I retained pride, if not courage; and in my own mind I said, "This is horror, but it is not fear; unless I fear I cannot be harmed; my reason rejects this thing; it is an illusion—I do not fear." With a violent effort I succeeded at last in stretching out my hand toward the weapon on the table; as I did so, on the arm and shoulder I received a strange shock, and my arm fell to my side powerless. And now, to add to my horror, the light began slowly to wane from the candles—they were not, as it were, extinguished, but their flame seemed very gradually withdrawn; it was the same with the fire—the light was extracted from the fuel; in a few minutes the room was in utter darkness. The dread that came over me, to be thus in the dark, with that dark thing, whose power was so intensely felt, brought a reaction of nerve. In fact, terror had reached that climax, that either my senses must have deserted me, or I must have burst through the spell. I did burst through it. I found voice, though the voice was a shriek. I remember that I broke forth with words like these: "I do not fear, my soul does not fear;" and at the same time I found strength to rise. Still in that profound gloom I rushed to one of the windows—tore aside the curtain—flung open the shutters; my first thought was—*light*. And when I saw the moon high, clear, and calm, I felt a joy that almost compensated for the previous terror. There was the moon; there was also the light from the gas-lamps in the deserted, slumberous street. I turned to look back into the room; the moon penetrated its shadow very palely and partially—but still there was light. The dark Thing, whatever it might be, was gone—except that I could yet see a dim shadow—the shadow of that shade against the opposite wall.

My eye now rested on the table, and from under the table (which was without cloth or cover—an old mahogany round table) there rose a hand, visible as far as the wrist. It was a hand, seemingly, as much of flesh and blood as my own, but the hand of an aged person—lean, wrinkled, small, too—a woman's hand. That hand very softly closed on the two letters that lay on the table; hand and letters both vanished. Then there came the same three loud knocks I had heard at the bed-head before this extraordinary drama had commenced.

As these sounds slowly ceased, I felt the whole room vibrate sensibly; and at the far end there rose, as from the floor, sparks or globules, like bubbles of light, many-colored—green, yellow, fire-red, azure. Up and down, to and fro, hither, thither, as tiny Will-o'-the-Wisps, the sparks moved, slow or swift, each at its own caprice. A chair (as in the drawing room below) was now advanced from the wall without apparent agency, and placed at the opposite side of the table. Suddenly, as forth from the chair, there grew a shape—a woman's shape. It was distinct as a shape of life—ghastly as a shape of death. The face was that of youth, with a strange, mournful beauty; the throat and shoulders were bare, the rest of the form in a loose robe of cloudy white. It began sleeking its long yellow hair, which fell over its shoulders; its eyes were not turned toward me, but to the door; it seemed listening, watching, waiting. The shadow of the shade in the background grew darker; and again I thought I beheld the eyes gleaming out from the summit of the shadow—eyes fixed upon that shape.

"FORTH FROM THE CHAIR, THERE GREW A SHAPE—A WOMAN'S SHAPE."

As if from the door, though it did not open, there grew out another shape, equally distinct, equally ghastly—a man's shape —a young man's. It was in the dress of the last century, or rather in a likeness of such dress (for both the male shape and the female, though defined, were evidently unsubstantial, impalpable—simulacra—phantasms); and there was something incongruous, grotesque, yet fearful in the contrast between the elaborate finery, the courtly precision of that old-fashioned garb, with its ruffles, and lace, and buckles, and the corpse-like aspect and ghost-like stillness of the flitting wearer. Just as the male shape approached the female, the dark Shadow started from the wall; all three for a moment wrapped in darkness. When the pale light returned the two phantoms were as in the grasp of the Shadow that towered between them; and there was a blood-stain on the breast of the female; and the phantom male was leaning on its phantom sword, and blood seemed trickling fast from the ruffles, from the lace, and the darkness of the intermediate Shadow swallowed them up—they were gone.

And again the bubbles of light shot, and sailed, and undulated, growing thicker and thicker and more wildly confused in their movements.

"OVER HER SHOULDER I SAW A LIVID FACE."

The closet door to the right of the fire-place now opened, and from the aperture there came the form of an aged woman. In her hand she held letters, the very letters—over which I had seen the Hand close; and behind her I heard a footstep. She turned round as if to listen, and then she opened the letters and seemed to read; and over her shoulder I saw a livid face, the face as of a man long drowned—bloated, bleached—seaweed tangled in its dripping hair; and at her feet lay a form as of a corpse, and beside the corpse there cowered a child, a miserable, squalid child, with famine in its cheeks and fear in its eyes. And as I looked in the old woman's face, the wrinkles and lines vanished, and it became a face of youth—hard-eyed, stony, but still youth; and the Shadow darted forth and darkened over these phantoms as it had darkened over the last.

Nothing now was left but the Shadow, and on that my eyes were intently fixed, till again eyes grew out of the Shadow—malignant, serpent eyes. And the bubbles of light again rose and fell, and in their disordered, irregular, turbulent maze, mingled with the wan moonlight. And now from these globules themselves, as from the shell of an egg, monstrous things burst out; the air was filled with them; larvæ so bloodless and so hideous that I can in no way describe them except to remind the reader of the swarming life which the solar microscope brings before the eyes in a drop of water—things transparent, supple, agile, chasing each other, devouring each other—forms like nought ever beheld by the naked eye. As the shapes were without symmetry, so their movements were without order. In their very vagrancies there was no sport; they came round me and round, thicker and faster and swifter, swarming over my head, crawling over my right arm, which was outstretched in involuntary command against all evil beings. Sometimes I felt myself touched, but not by them; invisible hands touched me. Once I felt the clutch as of cold, soft fingers at my throat. I was still equally conscious that if I gave way to fear I should be in bodily peril; and I concentred all my faculties in the single focus of resisting, stubborn will. And I turned my sight from the Shadow—above all, from those strange, serpent eyes—eyes that had now become distinctly visible. For there, though in nought else around me, I was aware that there was a WILL, and a will of intense, creative, working evil, which might crush down my own.

The pale atmosphere in the room began now to redden as if in the air of some near conflagration. The larvæ grew lurid as things that live on fire. Again the room vibrated; again were heard the three measured knocks; and again all things were swallowed up in the darkness of the dark Shadow, as if out of that darkness all had come, into that darkness all returned.

As the gloom receded, the shadow was wholly gone. Slowly as it had been withdrawn, the flame grew again into the candles on the table, again into the fuel in the grate.

The whole room came once more calmly, healthfully into sight.

The two doors were still closed, the door communicating with the servants' room still locked. In the corner of the wall, into which he had so convulsively niched himself, lay the dog. I called to him—no movement; I approached—the animal was dead; his eyes protruded; his tongue out of his mouth; the froth gathered round his jaws. I took him in my arms; I brought him to the fire; I felt acute grief for the loss of my poor favorite—acute self-reproach; I accused myself of his death; I imagined he had died of fright. But what was my surprise on finding that his neck was actually broken. Had this been done in the dark?—must it not have been by a hand human as mine?—must there not have been a human agency all the while in that room? Good cause to suspect it. I cannot tell. The reader may draw his own inference.

Another surprising circumstance—my watch was restored to the table from which it had been so mysteriously withdrawn; but it had stopped at the very moment it was so withdrawn; nor, despite all the skill of the watchmaker, has it ever gone since; that is, it will go in a strange, erratic way for a few hours, and then come to a dead stop—it is worthless.

Nothing more chanced for the rest of the night. Nor, indeed, had I long to wait before the dawn broke. Not till it was broad daylight did I quit the haunted house. Before I did so, I revisited the little blind room in which my servant and myself had been for a time imprisoned. I had a strong impression—for which I could not account—that from that room had originated the mechanism of the phenomena—if I may use the term—which had been experienced in my chamber. And though I entered now in the clear day, with the sun peering through the filmy window, I still felt, as I stood on its floor, the creep of horror which I had first there experienced the night before, and which had been so aggravated by what had passed in my own chamber. I could not, indeed, bear to stay more than half a minute within those walls.

"AGAIN I HEARD THE FOOTFALL BEFORE ME."

I descended the stairs, and again I heard the footfall before me; and when I opened the street door, I thought I could distinguish a very low laugh. I gained my own home, expecting to find my runaway servant there. But he had not presented himself, nor did I hear more of him for three days, when I received a letter from him, dated from Liverpool, to this effect:

"HONORED SIR: I humbly entreat your pardon, though I can scarcely hope that you will think I deserve it, unless—which Heaven forbid!—you saw what I did. I feel that it will be years before I can recover myself; and as to being fit for service, it is out of the question. I am therefore going to my brother-in-law at Melbourne. The ship sails to-morrow. Perhaps the long voyage may set me up. I do nothing now but start and tremble, and fancy IT is behind me. I humbly beg you, honored sir, to order my clothes, and whatever wages are due to me, to be sent to my mother's, at Walworth—John knows her address."

The letter ended with additional apologies, somewhat incoherent, and explanatory details as to effects that had been under the writer's charge.

This flight may perhaps warrant a suspicion that the man wished to go to Australia, and had been somehow or other fraudulently mixed up with the events of the night. I say nothing in refutation of that conjecture; rather, I suggest it as one that would seem to many persons the most probable solution of improbable occurrences. My belief in my own theory remained unshaken. I returned in the evening to the house, to bring away in a hack-cab the things I had left there, with my poor dog's body. In this task I was not disturbed, nor did any incident worthy of note befall me, except that still, on ascending and descending the stairs, I heard the same footfall in advance. On leaving the house, I went to Mr. J——'s. He was at home. I returned him the keys, told him that my curiosity was sufficiently gratified, and was about to relate quickly what had passed, when he stopped me, and said, though with much politeness, that he had no longer any interest in a mystery which none had ever solved.

I determined at least to tell him of the two letters I had read, as well as of the extraordinary manner in which they had disappeared, and I then inquired if he thought thay had been addressed to the woman who had died in the house, and if there were anything in her early history which could possibly confirm the dark suspicions to which the letters gave rise. Mr. J—— seemed startled, and after musing a few moments, answered

"IF WE COULD GET TO THE BOTTOM OF THESE MYSTERIES, WE SHOULD FIND A LIVING HUMAN AGENCY."

"I am but little acquainted with the woman's earlier history, except, as I before told you, that her family were known to mine. But you revive some vague reminiscences to her prejudice. I will make inquiries, and inform you of their result. Still, even if I could admit the popular superstition that a person who had been either the perpetrator or the victim of dark crimes in life could revisit, as a restless spirit, the scene in which those crimes had been committed, I should observe that the house was infested by strange sights and sounds before the old woman died—you smile—what would you say?

"I should say this, that I am convinced, if we could get to the bottom of these mysteries, we should find a living human agency."

(*To be continued.*)

THE EDITORS TABLE

We want names and Post Office addresses (plainly written) of every civil engineer, supervisor, selectman, road commissioner, chosen freeholder, contractor, city engineer, surveyor and legislator in the United States. Kindly send all the names you can to GOOD ROADS, *Potter Building, New York.*

SANFORD LAWTON.

SANFORD LAWTON is dead. To all who have known the League through the years of its checkered history, this announcement will come with peculiar sadness, for Sanford Lawton was a genial, zealous and consistent friend whom everybody loved and whose kindly way endeared him to all who came within the range of his personal influence. His official services to the League were always of the highest quality, displaying ability and method that gave to his work an added value and earned the commendation of his associates. No word of ours can soften the grief or lessen the void that will be felt since Sanford Lawton has gone to the great majority, but we add our tribute to that of the thousand friends whose sorrow makes the name of Sanford Lawton a hallowed memory.

THE massing of a large number of wheelmen at Washington in the middle of July demonstrated the fact that hot weather has no terrors to the average League member, and the meet may be safely described as one of the most successful in the history of the organization.

IT was a fortunate concurrence of events that brought prominent League officials to Washington at a time when the Congressional bill to create a national highway commission was in need of active and persistent aid. The bill has been greatly shortened and simplified since introduction, and in its present form reads as follows:

A bill to create a national highway commission and prescribe its duties.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

That a national highway commission, to be composed of two Senators, five members of the House of Representatives, and five citizens appointed by the President, be created for the purpose of a general inquiry into the condition of highways in the United States and means for their improvement, and especially the best method of securing a proper exhibit at the World's Columbian Exposition of approved appliances for road making and of providing for public instruction in the art during the Exposition.

Sec. 2. That the commission shall hold its first meeting at the office of the World's Columbian Commission in Chicago, at noon, on the twenty-fifth day of October, eighteen hundred and ninety-two, and shall make a preliminary report to Congress at the beginning of the next session covering its recommendations respecting the Exposition and its general plan of inquiry and action.

GENERAL STONE, the originator of the bill, was on the ground, and his work received an amazing impetus by the efforts of President Burdett, Chairman Dunn of the Committee on Legislation, Chief Consul Gerould and others who appeared before committees of both the Senate and House and by the cooperation of division officers in several States who wired their respective Congressmen the passage of the bill was secured in the Senate, and its favorable report made to the House by Mr. Durborow on July 23.

JUST at present the House is engaged in an edifying investigation of the relative stimulating qualities of whiskey and cold tea. If the lingering members should be fortunate enough to settle this momentous question it is fairly possible that time enough will be taken to insure the passage of the highway commission bill, but however this may be, the whiskey and cold tea question must not be neglected.

CHAIRMAN JAMES R. DUNN, of the National Committee on Legislation, is entitled to special credit for the heroic and successful work he accomplished at Washington in aid of the national highway commission bill during the sweltering days immediately succeeding the July meet.

RHODE ISLAND is unusually active in her work for road reform and the following resolution passed by the General Assembly of that State last April has opened the way for much agitation from which solid good will eventually come:

"*Resolved*, That Messrs. Beane, Read and Woods on the part of the Senate, and Messrs. Chase, Covell, Wilson, Parks and Clarke on the part of the House, are hereby constituted a committee to examine into the condition of the roads and public highways of the State with a view to improvement in their construction and maintenance; and to revise and consolidate the laws relating to the same; and report to the General Assembly by bill or otherwise, at its January session, 1893, the result of their labors. And the sum of one thousand dollars, or so much thereof as may be necessary, is hereby appropriated for clerical and transportation expenses; and the State auditor is hereby directed to draw his orders on the General Treasurer, from time to time, for the payment of the same upon vouchers approved by the Governor."

The commission has begun its work by sending to town officials in all parts of the State, a list of questions upon the subject of existing roads and road management, and in this manner it is believed that a comprehensive statement of Rhode Island's needs can be made up. The commission will also provide for one or more public hearing at which may be presented the ideas and arguments of citizens who feel an interest in the general subject.

ARRANGEMENTS are being rapidly perfected for the great Missouri Road Convention at Chillicothe, to be held August 15 to 18 inclusive, and, if indications count for anything, the convention will be a monster success. Secretary Chubbuck, of the Missouri State Board of Agriculture, is working hard to enlarge the interest for better roads among the farmers of his State, and as a promoter of the coming convention he is conspicuous by his untiring work. Speakers are expected from different parts of the country, practical exhibitions will be held at which the different methods of road making will be illustrated and road machines operated and explained and fullest information will be supplied on all the various phases of the subject. It is hoped and believed that the Missouri meeting will be an unqualified success.

THE Boston Boot and Shoe Club, the largest dining association in New England, will hold its annual Summer festival in Boston on August 17, and its officers are arranging to make the event one of practical use to the community at large. The subjects for after dinner speeches are limited to two: "Roadways and Roadmaking" and "The Metropolitan Park System of Boston." Among the speakers expected to be present are Governor Russell of Massachusetts, Mayor Matthews of Boston, Colonel Albert A. Pope, Prof. N. S. Shaler, Hon. Henry Cabot Lodge and others of prominence.

THE political pot will soon begin to boil and your vote and ours, dear reader, will be matters of deep concern on the part of aspiring politicians; but when once the election is over, the aspiring candidate, whether elected or defeated, is generally as bloodless as a dead fish and more exclusive than a rattlesnake. If you can get together twenty-five or fifty good fellows in your community who will mutually agree to forsake other considerations and vote for the man who will declare himself in favor of improved roads, you will be doing missionary work of the most substantial and effective kind, and your votes will be cast to the everlasting benefit of the country whose good is our good and to sustain whose institutions we should seek to cast an intelligent ballot. We should have one party and one platform with a single plank: better roads for all and equal rights thereon.

NEWS AND COMMENT

We want names and Post Office addresses (plainly written) of every civil engineer, supervisor, selectman, road commissioner, chosen freeholder, contractor, city engineer, surveyor and legislator in the United States. Kindly send all the names you can to GOOD ROADS, *Potter Building, New York.*

Two years ago a delegation of farmers from the town of Guilderland in Albany County, N. Y., waded through the mud to get down to the capital to oppose a bill for improvement of the roads, because the town taxes would be increased by that improvement to the amount of about $1,250. As if to show the Guilderland farmers the folly of this method of "economy," a citizen of the county soon afterwards met with an accident by the breaking down of one of the ramshackle bridges, and the Guilderland farmers are now blessing themselves with the prospect of paying damages and costs to the tune of $12,000, to satisfy a judgment for that amount lately entered in the New York Supreme Court.

MR. W. C. MUNRO, of Cincinnati, quotes for our information an extract from a recent business letter in his possession: "There is hardly anything to write about; the dullness is really phenomenal. The explanation of this is that the condition of the back country roads is so horrible that farmers are unable to move from their farms, and as a result, the country merchant is doing nothing, either in way of selling or buying, and this has its reflex upon the city trade."

FREEMONT HILL, Civil Engineer, of the firm of Alexander Hill & Dunlap of Chicago, puts it like this:

"Two million farmers lose five days per annum in not being able to haul their product to depots on account of *bad roads*. Five days at $2.00 per day equals $10.00 per annum each. Loss to 2,000,000 farmers at $10.00 each equals $20,000,000. Where is Jerry Rusk, the *Farmer's Moses?* This amount is but an item of general loss composed of time, wear on harness, horse, vehicle and morals. Inability to reach market when prices are good and hundreds of other items just as interesting. Give the farmers the acres going to waste in the sixty-six feet roads. Make the road narrow (thirty feet), but use the valuation of the sides in making the rest available for use."

DANIEL O'FLAHERTY, C. E., of Kansas City, Mo., has addressed a timely and excellent letter to the presiding judges of several of the counties of Missouri, setting forth the great value of improved roads and urging upon the judges the importance of making it a prominent subject of public action. Mr. O'Flaherty's letter concludes with the words, "I shall be glad to furnish you any information you may desire relative to Macadam or gravel roads of any kind, their construction, cost, etc."

THE Missouri State Road Convention, lately held at Springfield, appears to have been most successfully conducted, and important steps were taken to perfect the organization and extend the roads improvement movement throughout the State. The Committee on Resolutions presented the following recommendations, which were adopted:

1. The enlargement of the power of counties, townships and road districts in the matter of devising ways and means for the improvement of public highways, so that the largest portion possible of the public revenues may go to a fund to be used solely for road improvement; the enlargement of road districts as to give longer employment through the season of road work, so as to secure greater skill, and the use of improved machines in road construction.

2. That all State and county revenues from dramshop licenses and all such revenues in cities of the second class, be applied to building, maintaining and repairing public streets and highways.

3. That provision should be made by law whereby private citizens may subscribe for building public graded and paved roads in part, and be entitled to aid in such work from public funds.

4. That provision should be made by law whereby townships, districts or other subdivisions of the State may organize, upon a vote of the people, for road purposes, and for building and maintaining public roads.

5. The submission to a vote of the people of a constitutional amendment lodging in the various counties of the State the power to determine the question of the sum to be raised by the taxation of its citizens for the purpose of improving the public highways, so that the improvement of roads and the provision of ways and means therefor shall be subject to the decision of each county by a vote of the people thereof.

6. That in each county and township in the State there shall be formed a "road association," having a president, vice-president and secretary, the purposes of which will be to obtain information and data to inaugurate road improvement in their respective districts, to have unofficially and generally in charge the public interests in respect to such improvement, and to cooperate with the State Road Improvement Association.

MESSRS. A. I. NICHOLAS, Official Reporter, and J. J. Sullivan, Prosecuting Attorney, of Trumbull County, Ohio, have begun an excellent work by addressing letters to the leading officials of Ohio setting forth the advantages of better roads, the strength of the organized movement in their favor and the importance of a recognition of this movement by the great political parties. No method of individual work could be better conceived or more effectively carried out.

SECRETARY CHUBBUCK, of the Missouri State Board of Agriculture, writes us that the outlook is most encouraging for a successful road convention at Chillicothe, Mo., on August 16–19. The county courts are appointing delegates in many parts of the State, and railroads are making large concessions in the way of reduced passenger and freight rates. Prominent speakers are expected from different parts of the country, and altogether the work in Missouri has taken on a hopeful appearance.

PIKE COUNTY, Missouri, having found her 100 miles of good gravel roads to be a splendid investment, is considering the question of making them still better and extending the system to all parts of the county. Mayor Perse and Mr. Edgar F. Barnes, of Louisiana, Mo., are prominent agitators for good roads, and general sentiment of the community in that section is likely to give them plenty of encouragement.

"The beautiful little city of Canton, Ill., had a diverting topic during the late rainy spell," says the Chicago *Herald*. 'A farmer had come to town with a load of corn, and on the way to the elevator the wheels sunk in mud up to the hubs. Three teams would not budge the load. Fortunately the 'stall' was near the tracks of the Toledo, Peoria & Warsaw Railroad, and an obliging freight conductor and engineer unhooked the locomotive, brought the wreck cable from the caboose and yanked the vehicle out of the rut in a jiffy. The mudhole was a curiosity as long as it lasted, and citizens pointed it out to strangers for days afterward.' "—*The Wheel.*

AT Creston, Ia., the body of a prominent physician, Dr. J. B. Wilson, who died about the 1st of April last, was embalmed and kept in his house for two weeks because the road to the cemetery (less than a mile from the city limit) was absolutely impassable for vehicles. This road, moreover, is one of the principal highway roads leading to the city, and of course was useless for farmers, stockmen and traders.

MAYOR KENNEDY, of Alleghany, Pa., an ardent advocate of improved streets, has in connection with bringing this important subject before the City Council, issued a circular letter to the taxpayers asking their views in the matter. He has received numerous replies, which almost without exception heartily approve the movement.

POPULAR OPINION

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"If present indications are to be depended upon to-day's American bicyclists will be remembered with great gratitude by coming generations. They are working for a reform which they claim will have more effect on the material interests of the country a century hence than will the tariff or the silver question. They are carrying on a vigorous agitation for good country roads, and it is already showing signs of ultimate success."—*New York Press.*

"Through kindness of a cousin and namesake in Washington, A. Preston Dunlap, a few copies of GOOD ROADS have come to my table and have been read with peculiar interest. The bad roads of the past six months, or rather almost absence of roads, has curtailed my practice fully $1,000—quite an item. People here are just awakening to the absolute necessity of doing something."—*Dr. Albert Dunlap, Creston, Ia.*

"GOOD ROADS has evidently come into the literary field to stay. None of the six numbers so far issued show falling off in general value, but rather an increasing breadth of outlook over matters that are of importance to wheelmen, farmers, engineers, cattle owners and horsemen. The scope of the magazine may be perceived by examining the contents of, for instance, the June number, which contains, among other articles, 'Our First Artificial Road,' by Horace J. Smith; 'A Word of Contrast,' by Charles Kendall Adams, LL. D.; 'Asphalt and its Uses,' by Col. Francis V. Greene; 'Streets and Roads of Washington, by Frank L. Dyer; 'Dirt Roads and Gravel Roads,' by Isaac B. Potter;—some of them carefully illustrated. As the motive for publication is a worthy one, the magazine should be widely circulated and liberally subscribed for."—"*Our Animal Friends,*" *New York City.*

"An excellent journal named GOOD ROADS is published at the Potter Building, New York. It contains much information on road building, and it would be a good idea for all the supervisors, highway commissioners, road overseers and civil engineers in the country to subscribe for GOOD ROADS.—*Southside* (*N. Y.*) *Observer.*

"A friend has presented GOOD ROADS to the town fathers of Claremont. I want them to order six copies for every public library. GOOD ROADS would be the greatest novel (ty) of the age in this country."—*Leavitt Hunt, Weathersfield, Vt.*

"'A prudent man looketh well to his going.' So says Solomon. His going in Boone County is pretty bad on mud roads. Think of a nation being hub-deep in the mud. We have stood it for a century. If you don't want to stand it any longer, send for the magazine devoted to the Gospel of Good Roads. It costs $2.00 a year. Sample copies will be sent for twenty cents. Address, GOOD ROADS, Potter Building, New York City."—*The Gospel Visitor, Belvidere, Ill.*

"I am in receipt of your handsome monthly (may it be as powerful as handsome) and note your expressed desire for names of engineers, selectmen, etc., and in accordance therewith send list enclosed. Shall esteem it a favor to be given anything to do, not conflicting with my duties, in the cause. —*Chas. A. Andrus, Consulate General, U. S. A., Nuevo Laredo, Mexico.*

"One of the best features of the L. A. W. is the work being done throughout the country to promote the maintenance of good roads, and to my mind GOOD ROADS is doing yeoman service to this end. A friend of mine from Cincinnati called at my office the other day, and I at once brought up the subject of Ohio roads. He was the more interested as he was chairman of a town committee in a suburban village near Cain, and now engaged in putting down cement sidewalks through the village, to be followed by attention to street roads as soon as the present job is completed. I inquired if he had seen GOOD ROADS; he replied in the negative, and I induced him to become a subscriber and received his promise that he would do all he could to talk the subject up, and use his influence to bring the necessity of better roads in Ohio to the minds of his friends and associates. Please send GOOD ROADS for one year to * * * ."—*R. M. Fuller, New York City.*

"GOOD ROADS, a monthly magazine published by the League of American Wheelmen, is an agent through which much interest and instructive information is disseminated. Isaac B. Potter is the managing editor and has been doing a great deal of earnest and energetic work in this cause. * * * The League of American Wheelmen is to be credited with a good thing, having done a great deal for the improvement of our roads. The effect of its work is becoming noticeable in many localities. * * * Roads improvement means farm improvement for the farmer, trade improvement for the tradesman and larger profits for both on account of the reduced expenses in getting farm produce to market."—*Utica Observer.*

QUERIES AND ANSWERS

We want names and Post Office addresses (plainly written) of every civil engineer, supervisor, selectman, road commissioner, chosen freeholder, contractor, city engineer, surveyor and legislator in the United States. Kindly send all the names you can to GOOD ROADS, *Potter Building, New York.*

"L. M. G."—We believe the old English statute relating to the width of tires on wagon wheels is still in force in England. It is the General Turnpike Act and regulates the weight to be allowed to wagons, carts, etc., having tires 9, 6 and 4½ inches wide respectively. The limit of weight for wagons with 9 inch tires is 6½ tons; with 6 inch tires, 4¾ tons; for 4½ inch tires, 4¼ tons, and wagons with tires of less than 4½ are limited to 3¼ tons. A distinction is made between Summer and Winter, the limit of weight in the latter season being a trifle less than in Summer. An increased charge of toll is made for over-weight above the statutory figures and one-half more toll is charged against wagons with tires of less breadth than 4½ inches.

"CALVIN DICKEY."—Furnace slag has been used with much success in road making in some localities, and it may safely be employed for bottom and intermediate courses, though generally inferior to trap rock for surfacing. It should be laid on a hard rolled surface when possible, to lessen the danger of settling in soft places. For your information, we copy the following from a back number of the *Engineering and Building Record*: "The ordinary brittle slag makes a very good foundation for a road, particularly on clay and wet soils, as by rolling, the top pieces form a powder that fills the interstices between the lower fragments so thoroughly that neither clay nor mud can work up through the layer, and on this the more durable wearing layers can be placed. It was found impossible to form any roads on the soft clay surface of the Centennial Fair Grounds at Philadelphia, until their beds had been prepared by a layer of well rolled furnace slag, after which they stood very heavy teaming without underdraining; the bonding of the fragments of slag with the thorough filling of the interstices preventing any mud from working through the first or lower layer, thus keeping the road from breaking up.

"In the Hanover district of Germany, the blast furnaces make a specialty of a road-metaling material called slag-stone. For its preparation the slag as tapped from the furnace is run into a bottomless cast-iron mould, which is tapering to the top and stands on an iron truck. After the slag has cooled enough to have an outer shell sufficiently strong to support the melted mass inside, the mould is lifted off and placed on another truck ready for use, while the loaded truck is run off to the dump-heap, where the truncated cone is pierced and the slag run on to the ground and covered with cinders and ashes and allowed to cool very slowly. This makes the slag much tougher than when allowed to cool in the open air, and it is said to wear very well when broken properly and placed on roads."

"Dirt Roads and Gravel Roads" will probably be published in pamphlet form, though we cannot now fix the date when it will appear.

"F. S."—The cost of laying five inch drain tile under the conditions you name would be about as follows, per hundred feet: Cost of tile, $2.80; digging ditch and laying, $1.50 (for three foot ditch), $2.00 (four foot ditch), $3.00 (five foot ditch); cost for filling ditch would be about 30 cents, 42 cents and 60 cents per hundred feet respectively for the three depths mentioned. Total cost per hundred feet would be $4.60, $5.22 and $6.40 for the different depths. Ditchers usually lay tile by the rod, but we have made estimate per hundred feet to facilitate your work.

CONTRACT NOTES

We want names and Post Office addresses (plainly written) of every civil engineer, supervisor, selectman, road commissioner, chosen freeholder, contractor, city engineer, surveyor and legislator in the United States. Kindly send all the names you can to GOOD ROADS, *Potter Building, New York.*

ROADS AND STREETS.

ILLINOIS.—LA SALLE.—Bids are asked by J. E. Skelly, City Clerk, as follows: for 11,500 yards paving with double layer brick on sand and 2,910 feet sandstone curbing.

MARYLAND.—BEL AIR.—Proposals are asked for opening the new road leading from Bush to Harford Station.

HAGERSTOWN.—At a meeting of the Mayor and Council it was agreed to sell $7,000 of additional improvement bonds. $4,000 to be used for street improvement and the remainder for drains.

ROCKVILLE.—Bids are asked by the Town Council for 700 to 1,000 yards of brick pavement.

MASSACHUSETTS.—SPRINGFIELD.—Work will be done on the Armory Street crossing early in the fall. The cost of grading and filling is estimated at $57,000.

DEDHAM.—At a town meeting held recently it was voted to appropriate $3,000 for the regrading and improvement of High Street between Memorial Hall and Westfield Street, and also $1,500 for a drain near the junction of High and Common Streets.

BOSTON.—Two more fine boulevards are to be added to the system of roadways. It is contemplated to extend Boylston Street to Brookline Avenue by a new thoroughfare 120 feet wide and 2,200 feet long, and the second boulevard is to skirt along Franklin Park and will run for three miles toward the Blue Hills beyond Roxbury.

Plans have been prepared and it is proposed to build a boulevard from BROCKTON to WHITMAN at an estimated cost of $21,000.

MISSOURI.—KANSAS CITY.—A boulevard is proposed in Eleventh Street, estimated to cost $550,000.

NEBRASKA.—HASTINGS has voted bonds for $24,000 for paving purposes.

OMAHA.—Twenty-Second Street is to be paved.

NEW JERSEY.—Bids are asked for grading, regulating and improving the new boulevard between KILL VON KULL and BAYONNE, also for building culverts, sewers and drain pipes. Bids should be sent to the Freeholders' office, where plans, etc., can be seen.

ELIZABETH.—Sealed proposals are asked and will be received by the Street Commissioner, Patrick McKeon, for paving Washington Avenue from Broad to Grove Street. The work to be done and materials furnished. It will require 4,000 feet of curb reset, 9,700 yards of pavement and 700 feet of bridgestone. Paving to be done with trap block.

ORANGE.—The Township Committee has decided to borrow $1,000 to repair the roads.

MOUNT HOLLY.—The roadways of the town are to be improved.

TRENTON.—Bids are asked by the Board of Public Works for paving Jackson Street from the southerly line of Greenwood Avenue to the southerly line of Market Street, with vitrified paving brick, in accordance with specifications to be seen at the office of the City Surveyor in the City Hall.

NEW YORK.—FLUSHING.—$70,000 in addition to $40,000 recently spent for that purpose will be spent in macadamizing the streets of the village.

TROY.—The Board of Aldermen has voted to pave two streets with granite block and three with asphalt.

LITTLE FALLS.—Sealed proposals are asked for the opening, grading and construction of Prospect Street extension. Information can be had on application to W. D. Newell, Clerk of the village.

AUBURN.—Bids are asked by the Common Council for paving Clark Street with vitrified brick according to specifications to be seen at the office of the City Surveyor.

CORNING.—The City Engineer asks bids for grading the Park according to the plans and specifications adopted by the Commission.

BROOKLYN.—Bids are asked by the Commissioner of City Works for grading and paving Thirty-Ninth Street from Eighth Avenue to the City Line with cobblestone pavement.

GRAVESEND.—The Sheepshead Bay Road from Ocean Parkway to the old Shore Road is to be widened and macadamized.

OHIO.—FINDLAY.—Bids are asked for macadamizing. For information address the City Engineer.

MOUNT VERNON.—Bids are asked for brick paving.

TOLEDO.—Bids are asked by the City Clerk for paving three streets with Medina stone, brick, cedar blocks or asphalt.

MARTIN'S FERRY.—Sealed proposals will be received by the City Clerk for the improvement of Fifth Street, by furnishing the material, constructing the necessary foundation, and paving with hard burned paving brick from curb to curb.

PENNSYLVANIA.—EAST GOSHEN.—Arrangements are being made to open a new road.

MONONGAHELA CITY.—Bids are asked for furnishing materials and construction of pavement and curbing in Chess and Second Streets. Bids should be sent to J. B. Finley, Chairman of Street Committee, and plans, etc., can be seen at the office of the City Engineer.

BUTLER.—Bids are asked for grading, curbing and paving with vitrified fire brick, West Pearl Street. Plans, etc., can be seen at the office of the

City Engineer. Bids to be sent to Clerk of the Common Council.

SOUTH CHESTER'S Borough Council will borrow $600 on a note and $100,000 to pay for repaving Third Street.

RHODE ISLAND.—CRANSTON.—$10,000 has been voted by the Council to macadamize Broad Street. Bids will soon be asked.

SEWERS.

CALIFORNIA.—OAKLAND.—A petition has been filed with the City Council asking that body to order the construction of a sewer on Second Street, from Lewis to Henry Street.

COLORADO.—DENVER is to have an extensive sewer plant.

CONNECTICUT.—SOUTH NORWALK.—A new sewer will probably be built at an early day through State Street, from Madison Street to the new electric light station.

BRIDGEPORT.—At a recent meeting of the Committee on Sewers it was voted to recommend the construction of sewers in Williston Avenue, Yale Street, Park Avenue at the western end and Mead Street.

HARTFORD.—A plan for a sewer in Sargeant Street, from Woodland Street to the Garden Street sewer, has been recommended by the committee for adoption by the Board of Street Commissioners.

WATERBURY.—Bids are asked for the construction of a sewer and appurtenances in West Main Street from the Naugatuck River to the New York & New England Railroad. Bids should be sent to the Board of Sewer Commissioners at the City Hall.

GEORGIA.—COLUMBUS.—It is proposed to issue bonds for $135,000 to be expended on a sewer system.

ATLANTA.—A new sewer is to be constructed in Luckie Street from Alexander Street to North Avenue. The general character, material and size are to be about as follows: From Alexander to Mills, eight inch vitrified pipe; from Mills to Hunnicutt, twelve inch vitrified pipe; from Hunnicutt to Dairy, fifteen inch vitrified pipe; from Dairy to Gresham, eight inch vitrified pipe; and from Gresham to North Avenue, twelve inch vitrified pipe.

Atlanta is to have several new sewers. In Marietta Street from Foundry to Cone Street; in Walker and Nelson Streets from Haynes to Mangum Street and in Walker Street from Fair to Peters Street.

ILLINOIS.—ROCK ISLAND.—Six miles of sewers are to be built at an estimated cost of $23,000.

BLUE ISLAND.—Bids are asked for constructing Canal Street sub-main in Canal Street, Western Avenue and Broadway; sewer in Western Avenue, Maple Avenue and Massey and Cochran Streets. Plans and specifications can be seen at the office of G. L. Clausen, 161 La Salle Street, Chicago.

ELMHURST.—Bids are asked for the construction of the following sewers: Section L, 5 feet in diameter; Section 2, 4 feet in diameter; Section 3, 2 and 3 feet in diameter, and Section 4, for constructing a 2 foot brick and 15 inch tile pipe sub-main sewer. Information will be furnished on application to the Village Clerk.

INDIANA.—HUNTINGTON.—Bids are asked for all the labor and materials for constructing Flint Creek sewer. For plans and specifications, application should be made to the City Civil Engineer, H. H. Wagoner.

IOWA.—DAVENPORT.—Bids are asked for the materials and work necessary for the construction of the following sewers: 3,176 lineal feet of vitrified sewer pipe, twenty inches internal diameter with the necessary branches, Y's and manholes. Locust Street: 3,931 lineal feet of vitrified sewer pipe, twenty inches internal diameter with the necessary branches, Y's and manholes; 1,694 lineal feet of vitrified sewer pipe, twenty-two inches internal diameter with the necessary branches, Y's and manholes; 5,592 lineal feet of vitrified sewer pipe, twenty-four inches internal diameter with the necessary branches, Y's and manholes; and 1,870 lineal feet of 2 x 3 feet egg-shaped sewer, built of bricks in two rings, with the necessary branches, connections and manholes. Bids should be addressed to Charles Francis, Commissioner of Public Works, and should be marked "Proposals for Main Sewer in Fourth District." Information can be had on application to the commissioner.

LEEDS will shortly commence work on a surface and sewer drainage.

MASSACHUSETTS.—WEBSTER.—At a recent meeting of the town authorities it was voted to lay a water pipe on High Street from Main to Hill Street and thence through Hill Street to connect with the water pipe on School Street. It will take about 3,200 feet of pipe. The treasurer is authorized to borrow $3,000. $300 was also appropriated for repair of sidewalks.

WESTFIELD.—Sewers are to be laid in Court Street and Highland Avenue.

LAWRENCE.—Sewer extensions in thirteen streets have been recommended by the Street Commissioners.

NORTHAMPTON.—A number of new sewers are to be built in this town.

MICHIGAN.—DETROIT.—Proposals are asked for the construction of vitrified brick sewers in twenty of the principal streets.

BAY CITY.—The Board of Public Works has adopted a resolution that the Council order a sewer to be constructed on Dean Street.

MINNESOTA.—EAST GRAND FORKS.—Bids are asked for the construction of sewers. All bids to be addressed to J. R. Johnson, City Recorder, from whom all information can be had.

MISSOURI.—ST. JOSEPH.—Bids will soon be asked for the extension of the Mitchell Avenue sewer 13 x 14 feet, four ring brick.

ST. JOSEPH.—At a recent meeting the Council directed the Finance Committee to appropriate $30,000 for the Mitchell Avenue sewer extension.

NEW JERSEY.—ELIZABETH.—Bids are asked for laying sewers as follows: In Baltic Street from First Street to Third Avenue; Geneva Street from Elizabeth to Third Avenue; Rankin Street from First to Third Avenue; Delaware Street from First to Third Avenue; Florida Street from First to Third Avenue; and Atlantic Street from First to Third Avenue. Plans and specifications for the work can be seen at the office of the Street Commissioner, City Hall.

PLAINFIELD.—There is a movement on foot for a local sewerage system, and the Committee are considering the plan and will probably present it to the Common Council for approval at an early day.

FREEHOLD is to have a complete system of sewers.

JERSEY CITY.—Sealed proposals are asked by the Board of Street and Water Commissioners for the construction of a twenty-four inch brick sewer in Summit Avenue from Wayne Street to and connecting with the sewer in Montgomery Street. Blank forms of bids, plans, specifications, etc., can be had on application to the City Engineer.

NEW YORK.—SANDY HILL.—This village is to have a new sewer system.

WESTCHESTER.—Plans and specifications are in course of preparation for the construction of an outlet sewer in Jerome Avenue, from the Harlem River northward to Elliott Street, a distance of 6,506 feet.

COBLESKILL.—The citizens have voted in favor of a sewer system.

DUNKIRK.—Twelve inch pipe sewers are to be constructed in two streets.

ELMIRA.—Plans are in course of preparation for a relief outlet for the Water Street sewer at Lake Street.

TROY.—The Board of Aldermen has voted in favor of sewers in six streets.

ROME.—The town is to have a new storm sewer, the estimated cost of which is $9,640.

HOOSICK FALLS.—The Sewer Commissioners have decided to establish a perfect system of sewers in the village.

BUFFALO.—Bids are asked for constructing a 30, 20, 18, 15 and 12 inch tile sewer from a private sewer at a point 300 feet west of South Bailey Avenue and 250 feet north of Abbott Road, thence southwesterly to Bailey Avenue, thence southerly to the south side of Abbott Road, thence easterly to the southwest side of Triangle Street, thence in the southwest side of Triangle Street to White's Corners Road, thence in the west side of White's Corners Road to 25 feet north of Tifts Street. Bids should be sent to the Department of Public Works, Room 1, City Hall.

Bids are asked for the construction of tile, brick, and iron pipe sewers in several streets.

OHIO.—FREMONT.—Bids are asked for the Bull Run trunk sewer. For information, address the Town Council.

SPRINGFIELD.—Bids are asked for fifteen and eighteen inch pipe sewers.

TOLEDO.—Sealed proposals will be received until August 15th for the construction of cylindrical brick sewer.

WEST CLEVELAND.—The citizens have voted in favor of constructing a main sewer in the village.

CINCINNATI.—Sealed proposals are asked by A. P. Butterfield, Clerk, for the improvement of Boldface Creek and Boldface Road by constructing a trunk sewer and drain.

HAMILTON.—Bids are asked for the construction of a drain sewer in the Fifth Ward. J. J. McMahon, Clerk

PENNSYLVANIA. — TARENTUM. — Bids are asked for a sewerage plan for the borough. Plans, etc., can be seen at the office of the Council Clerk, South Canal Street.

LOCKHAVEN is to have a complete and perfect sewer system if they can possibly get it. Wilson Kistler, Chairman of the Sewerage Committee, desires correspondence with engineers in reference to giving grade, plot, etc.

WILMERDING.—This town though new proposes to borrow $75,000 to provide a complete system of sewers and pave all the streets.

READING.—Bids will be asked at an early day by the City Engineer for two sewers.

PHILADELPHIA.—Bids are asked for the construction of sewers on Fitzwater, Fifteenth, Forty-First, Ninth and Ogden Streets.

RHODE ISLAND.—PAWTUCKET.—The Common Council voted in favor of appropriating $105,150 for sewers.

VERMONT.—MONTPELIER.—The village trustees are looking into the question of a new sewerage system.

VIRGINIA.—CLIFTON FORGE.—A large portion of the town is to have sewerage.

WISCONSIN.—RHINELANDER is to have a complete sewerage system.

BRIDGES.

MASSACHUSETTS.—HOLYOKE.—Bids will soon be asked for the work on the new Dwight Street foot bridge.

NEW YORK.—KINGSTON.—The Town Board has voted $700 for the purpose of repairing and building two new bridges.

CONKLIN STATION.—Bids are asked for building an iron bridge on little Snake Creek at Conklin Station, according to plans and specifications to be seen on application to John W. Woodside, Commissioner of Highways.

WEST VIRGINIA.—BURNSVILLE.—A bridge is to be built over the little Kanawha River at this place, by order of the County Court.

MARYLAND.—ELLICOTT CITY.—Bids are asked for building a bridge at Brown's Ford, over the Patuxent River. Plans and specifications can be seen at the Commissioner's office.

NEW JERSEY. — BERNARDSVILLE. — A new wooden truss iron stringer bridge is to be built over the mill dam at this place.

SUMMIT.—A committee from the Union County Board of Freeholders, who visited Summit a short time ago, has agreed to construct an iron bridge on the road leading from Summit to Springfield, in place of the present wooden structure.

JERSEY CITY.—Two new iron bridges, to cost about $1,000,000 each, are to be built over the Hackensack River on the Newark Road.

FLORIDA.—FORT MYERS.—Bids are asked and will be received till September 5, 1892, for the building of a bridge over Orange Creek on the road to Alva. Plans, etc., can be had on application to J. W. Bain, Clerk of the County Commissioners at Fort Myers.

OHIO.—COLUMBUS.—A new bridge is to be built near Paris View.

SOUTH DAKOTA.—DEADWOOD.—A handsome iron bridge is to be built at Lee Street, in place of the old one being torn down.

WASHINGTON.—MT. VERNON.—Sealed bids are asked by Fred E. Pape, County Auditor, for the construction of a wagon bridge over the Skagit River at Mt. Vernon. Plans and specifications and all information can be had of the County Auditor.

BORROWED WIT

WATERMELONS AND GRASS.

Saidso—"The grass doesn't grow in the streets in this town." Upcreek—"Rather too rich; ever try watermelons?"—*New York Herald.*

SIX MEN OF HINDOSTAN.

There were six men of Hindostan
(If sages' tales are true)
Who rather plumed themselves upon
How very much they knew,
And intimated they could give
Old Solomon, did he but live,
A friendly tip or two.

One day these men of Hindostan
Went out to take a run,
And carried big umbrellas for
Protection from the sun;
But up there came a jimmy-cane
With forty different kinds of rain
Before their walk was done.

And then these men of Hindostan—
These men of wisdom vain,
Shut all their big umbrellas up,
TO KEEP THEM FROM THE RAIN;
And though the torrents roared and poured,
These men proclaimed, "We can't afford
To put 'em up again!"

Oh foolish men of Hindostan!
As foolish as a pup—
What wonder jeers fill all the land,
While sorrow fills your cup?
And yet there are wise business men in U. S. A.
who have not learned that in advertising—
like handling an umbrella in a storm, to be
successful,
You have to keep it up.

—*Springfield* (*O.*) *Republic-Times.*

THAT'S THE WAY OF IT.

He pitched his white tent in the wilds,
Far from the human "set";
And with a faith just like a child's
He said: "I'll get there yet."

He put him up a case of type,
A hand-press and a "stick,"
And there, where screamed the owl and snipe,
He made the letters "click."

They wondered what he was about
When in the woods they found him;
But when he got his paper out
They built a town around him.

—*Atlanta Constitution.*

A CHANCE TO BEGIN.

Sub-editor—Here is an article favoring a simplified spelling of the English language.

Editor—Who wrote it?

Sub-editor—A man named Smythe.—*Puck.*

THE RULE HAS ITS EXCEPTIONS.

Jabaway—There's reason in all things.

Jingler—You don't read magazine poetry, I see.—*Town Topics.*

"LITERATURE certainly runs in the Greensmith family. The two daughters write poetry that nobody will print, the sons write plays that nobody will act, and the mother writes novels that nobody will read."

"And what does the father write?"

"Oh, he writes checks that nobody will cash."—*Exchange.*

A GOOD TITLE.

Author (to friend who has just finished reading his MS.)—Can you suggest a title for my story? Something appropriate.

His Friend—Well, judging by the way the characters are killed off in the last chapter, I think "The Undertakers' Paradise" would be as appropriate as any.—*Life.*

WHAT HE CALLED FOR.

Stranger—Gimme a drink of four-dollar whiskey.

Bar Tender—There you are, sir.

Stranger—(smacking his lips)—By George that's good! How much?

Bar Tender—Four dollars.—*Puck.*

BRIGHT HITS.

"How I do like to look through a telescope!" exclaimed a young lady.

"Through a telescope?" sneered her sour-tempered old aunt. "Through a telescope? Humph! Give me a keyhole!"—*Blacksmith and Wheelwright.*

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Send for Catalogue.

"Let another man praise thee"

"Honest words of honest men."

From the Golden Gate.

The Columbia Light Roadster Safety Bicycle is, in my opinion, the best machine on the market. This is not my first experience with Columbia Wheels, as I rode a Columbia Expert, bought in 1885, for three years, and considered I had the best wheel in town for general use. I bought the Columbia Safety on the strength of the Columbia Wheel in general, and my own experience with one of them in particular, and I find that it fully meets my expectations.

C. H. OATMAN,
Sacramento,
Cal.

From the Balsamed Pines.

The wheels of my Columbia Century, equipped with pneumatic tires, have arrived, and I have tried the machine with perfect satisfaction and delight. The action of the Pope Mfg. Co. in this matter has established beyond the peradventure of a doubt that a guarantee from them means absolute indemnity in case of dissatisfaction with one of their wheels. I thank them, and wish for them such an increase in their business as their unimpeachable integrity deserves.

DRED PEACOCK,
Greensboro, N.C.

FROM THE

Heart of the Commonwealth.

I received my Century a few days ago, which I sent to your factory for repairs. The machine was badly damaged, for which I was wholly to blame, and I expected that it would cost at least $25 to repair it. I did not imagine that it could possibly be repaired as well as it was, and it is now as good as new. I was agreeably surprised to find that the charges were comparatively nothing, and I assure you that I am grateful for same. My wheel has had some very hard tests, especially the tires, and I am more than satisfied with it. I have no anxiety whatever concerning the tires, and I would rather have my wheel than any other that I know of. Thanking you for your prompt and liberal dealings with me, I remain,

JOHN W. HIGGINS, Worcester, Mass.

From Mustang's Land.

You will please find enclosed my check for $150.15, covering amount due you for wheel I purchased from you. Am well pleased with it, and should you want it back I will return it to you on payment of $300.00, otherwise I will stay with it.

A. G. ARMSTRONG, Mexico.

From our Longest Island.

I have just ridden the Century Columbia you supplied me with, and am delighted with it. I have studied all the machines exhibited at the Stanley Show (Eng.), and think the Century equals if it does not surpass them, in design, workmanship and finish. The balance is perfect, and I had no difficulty in riding hands off. It is the fastest machine I have ever ridden, as although I have been hard at work for the past month, and have had no exercise to speak of during the winter, I found the Century would move at the rate of 18 miles an hour for short distances, without very much exertion on my part.

ROLAND GREEN, Flatbush, L. I.

From Adirondack Breezes.

Thirteen years ago I purchased of you a full nickeled Standard Columbia—the first wheel I ever owned. It is still doing duty in this village, and every time I think of the old wheel it brings to my mind memories of many pleasant rides. I have pretty thoroughly tested the Century, and for design, finish and running qualities, also easy motion, is to me the ideal machine. I am perfectly satisfied with it in every respect.

N. R. GOURLEY, Glens Falls, N.Y.

20 CENTS A COPY. $2.00 A YEAR.

GOOD ROADS

"THE ROAD IS THAT PHYSICAL SIGN OR SYMBOL BY WHICH YOU WILL UNDERSTAND ANY AGE OR PEOPLE. IF THEY HAVE NO ROADS THEY ARE SAVAGES FOR THE ROAD IS THE CREATION OF MAN AND A TYPE OF CIVILIZED SOCIETY"

VOL. 2. SEPTEMBER, 1892. NO. 3.

An illustrated monthly magazine devoted to the improvement of the public roads and streets

"Wherever there is a great public highway, there is civilization, prosperity, value, cultivation. Isolation of communities is barbarism."

Col. John A. Price.

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ISAAC B. POTTER
Managing Editor
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GOOD ROADS.

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THE COST OF BAD ROADS.

By Ira O Baker, Professor of Civil Engineering, University of Illinois.

The bulk of the teaming upon our roads is in hauling grain to market. There is also a large but variable travel, the amount and character of which would be difficult to estimate, and is therefore not considered in this paper. To include it would largely increase my estimates of the cost of present defects. We will then consider only the traffic resulting from marketing the grain raised by the farmer.

PROF. IRA O. BAKER.

In order to estimate the amount of this traffic, I have obtained, as far as possible, from the railroads a statement of the number of carloads of grain shipped from certain points. In selecting these points I have purposely omitted the larger places, with their mixed traffic, and taken the small towns and villages, in which the traffic is almost exclusively due to the grain trade. Philo, Champaign County, is a type, and one which I shall use as an example in this paper. I have reports from towns which do a larger shipping business than Philo, but I take that place as an example because I have better opportunities of getting information there than anywhere else. From the books of grain dealers at these same points I have obtained data as to the number of bushels in the loads received by them, the average number of bushels per load when the roads were in their best condition, and the number of days per year in which grain was received, and also the average number of miles loads are hauled.

In reference to the cost of team, wagon, feed, etc., I have consulted our most successful and prudent farmers, and in differences of opinion taken the average. In no case have I trusted my own judgment nor drawn upon my own imagination. In short, as far as the time available for this purpose has permitted, I have left nothing undone which would add to the reliability and usefulness of my conclusions. So far as I know, this method of treatment is new, and for that reason I respectfully ask my readers to examine my line of argument and weigh my conclusions, that we may arrive at the truth of the matter.

The defects of any road may be grouped under one of three heads: First, it may involve an unnecessary amount of rise and fall; second, it may be unnecessarily long; third, it may have an imperfect road surface. We will consider these defects briefly in the order named, and try to get a money value for each.

VALUE OF SAVING OF RISE AND FALL.

It has been proven that a horse can exert twice his usual force for a short time without detriment. On our ordinary roads, drawing a load up a grade of one to twenty-five requires about twice as much power as to move the same load on the level. Therefore we may conclude that a grade less than one to twenty-five, whose length is so short that a horse may exert the extra power required by it, does not materially add to the cost of teaming on the road, provided, of course, these extra exertions are not required too frequently. The exact limits of these conditions are not known, and could be determined only approximately by experiments or observation.

If the grade is one to twenty-five, and of any considerable length, it has a very marked effect upon the cost of transportation, since the load carried over the whole road must be reduced to what can be carried up the ascent. Thus, if a long slope of one to twenty-five occurs on an otherwise level road, since a horse can draw up the grade only one-half of his full load, he can draw *on the level parts of the road* only one-half as much as he could and should draw *thereon* if it were not for the grade.

The average cost of teaming upon the roads, as determined by the method of investigation previously referred to, is $2.50 per day. The average distance of haul was determined to be between four and five miles, but in our computations we will use the latter, which is on the safe side. It was also determined that the average team could haul the average load eight to ten miles per day on the average roads, and taking ten miles per day as being safe, we find the cost of drawing a load to market to be $1.25, or twenty-five cents per mile. The average load is almost exactly one ton. The average cost per load then becomes twenty-five cents per ton per mile.

Now let us try to find the effect of, say, a half-mile of one to twenty-five grade, up which a team can take only one-half to three-quarters the full load. Making allowance for the lighter load on the level portions, we may take three-quarters of a ton as being on the safe side. Then, without the grade, the cost of hauling a ton a mile is twenty-five cents, whereas with the grade the cost is twenty-five cents for three-quarters of a ton, or thirty-three and one-third cents per ton per mile; or, in other words, the grade adds eight and one-third cents per ton per mile. The additional cost per load is five times this, or forty-one and two-thirds cents. This amount, multiplied by the number of loads going over the grade in a year, is the cost per year of this grade.

To illustrate: Roads within a half-mile of Philo carry 3,000 loads per year as an average. The cost per year of a one to twenty-five grade on a road with this traffic is 3,000 times 41 $^2/_3$ cents, or $1,250. This is the expense each year, and if the defect were removed the users could profitably afford to pay this sum annually. It would be better for the farmer and everybody else if this money were paid as annual interest for the money spent in making the improvement. Good authorities state that communities can borrow money for this purpose at five per cent. For the purpose of this paper we will take it at six per cent., which is on the safe side. The above amount—$1,250—is the interest, at six per cent., on $20,800. In other words, the community could borrow this amount, make this improvement, pay the annual interest, and be no worse off financially, and have a good road besides.

This amount—$1,250—would be the annual cost of a rise of 211 feet per mile, or $60 per foot. The cost of other grades will vary by a sliding scale, the consideration of which is beyond the limits of this paper. Lower grades will have a smaller value and steeper grades a greater value. Since the figure taken is an average value, it will do for an approximate basis to work upon. Whether this amount of money is sufficient to make the given improvement in any particular case is a question of the computation of the amount of earth to be moved. It is generally believed that road-making in Illinois is an easy matter as relates to grades, but really the opposite is the case, since the hollows are generally so wide as to require a great amount of earthwork to fill them.

The amount which may be expended to make any improvement in the grades varies as the traffic. Of course, the traffic going over any piece of road will decrease as we go from the town, and, therefore, also the amount which may economically be spent will decrease. The traffic will decrease as the area of the land which is tributary decreases, and also as the number of roads increases. We illustrate with Philo for an example. We previously investigated the case for the first half mile. Consider now the next half mile. In the previous case there were five roads, now there are eight. Before, twenty-four square miles were tributary, now it is twenty-one square miles. Before, the number of loads per year was 3,000, now it is only 1,450, or a little less than one-half as much. Therefore, the justifiable expenditure is only half as much as in the first half mile This amount must not be distributed over several grades, but be applied to the steepest. Furthermore, since the traffic is all in one direction, the money should be expended upon the steepest grade *up* which the loads must be taken. Steep grades in the other direction do but comparatively little harm. The down grades have a compensating effect, which, however, is not equal to that of the up grades. The principal effect of an up grade is to limit the greatest load that can be taken over the road, while the down grade simply diminishes the power required to move the load over a short portion of its length. We have considered the up grade as limiting only the size of the load. A grade also has the effect to increase the resistance, and therefore the cost of moving the load over the road. The method of investigation concerning this item is the same as that used in the next division of our subject.

We have omitted an advantage accruing from down grades and a disadvantage of the lighter grades. This disadvantage is considerably in excess of the advantage, and as the two are always found together, our conclusions are on the safe side.

VALUE OF SAVING DISTANCE.

Other things being equal, the shortest road is the best. Since the location of roads is determined largely by other considerations than the economical movement of traffic, we have less hope for improvements in this respect than in some others. We have previously determined the cost of hauling grain to be twenty-five cents a ton per mile for the average condition of our roads, or $1.25 per load for the average haul. This sum is made up of the cost of driving, feed, and wear and tear of horses, harness and wagon. Each of these items is affected by a saving in distance. About one-third of the expense for driver, say fifty cents per load, varies directly as the distance. The cost of feeding a team was found to be forty cents per day when working and twenty cents when not working; therefore, the cost of feed above twenty cents per day varies as the distance. The wear and tear, etc., varies as the distance to the amount of ten to twelve cents, or over, per load. Adding these several items we find that of the $1.25 which it costs to haul a load of grain to market, seventy cents varies as the distance; that is, fourteen cents per load (or ton) per mile varies as the distance. This amount, multiplied by the number of loads annually passing over a road, will give the amount which may profitably be spent annually to maintain any given saving of distance.

To illustrate: A certain road near Philo was originally laid out on the east and north sides of a quarter-section, but on account of low ground at the northeast corner, another road was opened on the south and west sides. The quarter in question is in one large field. The distance around is one mile. The distance diagonally across is about 71–100ths of a mile, a difference of 29–100ths of a mile. The saving per load over this distance would be 29–100ths of fourteen cents, and for the 3,000 loads per year, $121.80. And the diagonal road will occupy two and one-third acres less land than the longer one. This land rents for $4.00 per acre. It will cost less to repair the short than the long one, for the ground is equally as good, if not better. Summing these two items we find that the amount which may be spent annually to secure and maintain this improvement is $131.10. This is the interest at six per cent. on $2,185, which sum could be borrowed, used to secure this improvement and the community be no worse off financially, and have a better road besides.

VALUE OF IMPROVING THE SURFACE.

In this particular there is the best opportunity for and the most need of improving Illinois roads. The cost per load for five miles we have found to be $1.25. The pay of the driver will vary as the amount of grain hauled per load, and consequently the pay of the driver will vary as the resistance. The better the condition of the surface, the less the resistance; the less the resistance the greater will be the load; the greater the load, the sooner the grain is marketed. Therefore the expense for driver and for feed will vary as the defects of the road surface. The wear and tear on a good road would be only about half as much as upon our average roads. Adding these items we find that of the $1.25 which it costs to haul a load of grain to market, eighty cents varies as the condition of the road surface. The average load is a little less than four-fifths of that hauled when the roads are at their best. If the surface could be so improved that the average condition was equal to the present best condition, then the present weight of the load could be increased one-quarter without increasing the expense, and consequently one-fifth of the number of loads would be saved. The saving per load would be one-fifth of that part of the cost that varies with the condition of the surface, *i. e.*, the saving would be one-fifth of the eighty cents, as above, or sixteen cents per ton.

To illustrate: One yeа..ith another, Philo ships from 1,050 to 1,100 carloads of grain. Counting the average wagonload as previously determined, this is equivalent to 14,000 wagonloads entering Philo per year. If this grain had been brought in with the roads in first-rate condition it would have required only 10,500 loads. If the surface of our roads could be improved so as to be as good as they are at their best, there would be an annual saving of 3,500 loads entering Philo; and, according to our figures, the saving on each of these loads would have been sixty-four cents, or a total saving of $2,240. Or, taking the saving at sixteen cents per load on the present number of loads, we have a total saving of $2,240. This is the interest at six per cent. on $37,000, which sum true economy would indicate could be borrowed and profitably expended in bringing the roads centering in Philo up to the standard of the same roads during their best condition.

We believe these conclusions are on the safe side for these reasons: First, the improvement of the roads will increase the size of load, decrease the number of trips, giving the farmer more time for his other work, and thus increase the crops, which, in turn, will give more traffic, and, consequently, add to the value of the proposed improvement. Second, the improvement will decrease the number of days on which the farmer is required to haul, and he can therefore have more latitude in choosing his days, and be able to take advantage of the best condition of the roads—an important point in muddy seasons. Third, we have omitted the consideration of miscellaneous travel, and including which will still further increase the value of improvements.

A HIGGANUM (Conn.) peddler has a horse that chews tobacco, and likes it, says a truthful Yankee scribe. Nothing but fine cut suits his palate, and he has an ounce every morning for an after-breakfast cud. For sixteen years master and horse have been each other's sole companions, and he learned to chew as a colt, when steep hills made him halt, and a chew was given to start him. This proving effectual, the horse religiously stopped every morning until his cud was given him, as a matter of regular habit. If it is omitted now, he will refuse to stir a peg, and will neigh and stamp [illegible] feet to draw his master's attention to the omission.—*Blacksmith and Wheelwright.*

WAYS AND MEANS.

By Hon. J. L. Irwin, President, Missouri State Dairy Association.

METHODS of construction of better roads have been carefully and thoroughly discussed in these pages for the past few months. The question of ways and means has been touched but lightly if at all. These methods present themselves for adoption.

First, by organization of corporations and the building of toll roads. This has been done to a very limited extent. Henry Clay, nearly three-fourths of a century ago, pointed out the difficulty in the way of building corporate roads. He says: "The aggregate benefit resulting to society from a public improvement may be such as to amply justify the investment of capital, and yet the benefits may be so distributed that they can never be got to act in concert. The benefit resulting from a turnpike road made by private association is divided between the capitalist, who receives the tolls, and the lands through which the road passes, which are augmented in value, and the commodities whose value is enhanced because of diminished expense in transportation." This method has never become popular.

HON. J. L. IRWIN.

The second is a direct tax each year used in extending the roads little by little. This method is so slow and costly that it can never become general. There is clearly but one method by which a system of roads can be economically built and the burden of construction equitably distributed among those who have received the benefit, and that is, by bonds running a series of years, issued as the work of construction goes on.

The beneficent hand of the general government is so clearly felt and seen in our public school system, our post office system, our improvement of rivers and harbors, our Federal courts, that it seems to me wise and proper that the national Government is in a proper position to inaugurate a wise system of road improvement. Mr. Clem. Studebaker, in an article in Good Roads (April number), gave some very good reasons for Government superintendence in construction. My plan would be to enact a national road law, setting forth clearly specifications for constructions, superintendence, etc., for the acceptance of the States and territories; the payment of the interest on bonds to be issued by the States and territories for road construction by the national Government for a series of years. This would secure a low rate of interest and secure the sale of the bonds at par, sufficiently rapid construction to be economical, abundance of time to discharge present obligations, a thorough and harmonious system of roads. Suppose a national law was passed agreeing to pay three and one-half per cent. interest on bonds to be issued by the State, face payable by the State, to the amount of double the population of the State by the census of 1890, to run not less than fifteen nor more than thirty years, each year, for five years. And we take Missouri for an example. The population of Missouri is, in round numbers, 2,680,000. This would give Missouri something over $5,000,000 each year for a period of five years, or $26,800,000 of debt at the end of five years. Should every State in the Union accept the proposition the interest charge for the first year would be about four and two-fifths millions of dollars. The revenue from spirits and tobacco would easily meet this interest. In fifteen years, at the present rate of payment, almost all state, municipal and county debts will be paid. Taking the taxable increase of wealth from the State from 1870 to 1890, twenty years, as likely to continue, and in fifteen years the taxable wealth will be $1,100,000,000. Supposing there was no added wealth in consequence of the roads, only the natural present income—fifteen cents on the hundred dollars' valuation for fifteen years for a sinking fund would wipe out the debt. I am thoroughly satisfied that the distribution of this sum of money all over the State, the stimulus that it would give to development of industries, that less than ten cents on the hundred dollars' valuation would be ample sinking fund to wipe out the debt in fifteen years. The general government ought to bridge the navigable streams at important points.

Missouri is, on the average, 235 miles east and west, and 282 miles north and south, has an average of nine counties east and west and thirteen counties north and south. This sum would build a permanent road through the county seat of each county north and south and east and west, at an average cost of $4,600 per mile. Allowing all incorporated cities and towns to construct their own streets, this sum would be increased somewhat. The system would be fair, as when the population was dense more expensive roads would necessarily be constructed. It would furnish a basis or terminal for a local system that in the aggregate will save many millions of dollars, as a few miles of distance cuts little or no figure when there are perfect roads. After construction on this method, time will soon develop a proper system of maintenance.

IN England and on the Continent they have been for a long time using a horseshoe made by compressing common cowhide. It is composed of three thicknesses of cowskin pressed in a steel mould, and then subjected to a chemical preparation. It is claimed for it that it is much lighter, that it lasts longer, and that split hoofs are never known in horses using it. It is perfectly smooth at the bottom, no calks being required, the shoe adhering firmly to the most polished surface. Its elasticity prevents many strains, the horse's steps being lighter and surer.—*Blacksmith & Wheelwright.*

A HORSE has forty teeth, a mare only thirty-six (wanting the tusks or so-called wolf teeth); the ox and sheep tribes have only thirty-two (wanting the eight incisors in the upper jaw). The pig has forty-four teeth, the dog has forty-two, and mankind thirty-two.

THE FOLLY AND CRUELTY OF THE CHECK-REIN.*

By George T. Angell.

If a man has a heavy load to push or draw, he lowers his head by bending forward, and throws the weight of his body against, or to propel, the load; so does the ox or horse, under similar circumstances, if permitted.

If the man's head were tied to a belt around his body, so that he could not bend forward, he would lose the advantage of his weight, and could only pull or push with his muscles; so also with the ox or horse.

If the man's head were thus kept in a perpendicular position, he could not so readily see where to step, and would be more apt to stumble; so also with the ox or horse.

"STYLE."

No one in the saddle would thus tie up the head of his horse, and no one would expect a horse thus tied up to win a race; nor would any one think it an advantage to put check-reins on oxen.

The *London Horse-Book* says: "The horse is often prevented from throwing his weight into the collar by a TIGHT CHECK-REIN—a useless and painful incumberance, introduced by vanity, and retained by thoughtlessness amounting to cruelty. *Few of the London cab-drivers use check-reins*, knowing them to be inconsistent with proper work; and when one is observed, it will invariably be found to be on some poor animal, whose wearied and haggard appearance is attempted to be disguised by this instrument of torture.

***About 500 Veterinary Surgeons in Great Britain have signed a paper condemning tight check-reins as painful to horses and productive of disease.**

When a check-rein is used it should never be so tight that the horse cannot put his head where he would put it, without a check-rein, when drawing a load through sand or up hill.

"*The check-rein is, in nearly every case, painful to the animal and useless to the driver. Because*, it fastens the head in an *unnatural posture;* and, as the horse's shoulder and head fall together, cannot be of any real support in case of stumbling.

"When, from some defect in the animal, or other cause, the check-rein *is* used, it must be slackened. *Because*, in addition to the easier position of the neck, a greater portion of weight can be thrown into the collar, especially going up hill, thus saving a great and unnecessary expenditure of muscular power.

"There is an important difference between a *tight check-rein* and a *tightened rein*, although not generally understood. The first is injurious and cannot help the horse, while the latter is often useful. *Because*, the latter is a *steady support* to the animal's head from a distinct and intelligent source—the driver, whereas the former is only the horse's head fastened to his own shoulders. *That the check-rein is inconsistent with the action of the horse's head is clearly shown by the fact that, when a horse falls, it is always broken.*"

From the letters of an American gentleman traveling in Europe in 1869 and 1870, and which have been widely read in this country, I take the following, giving the places of date:

BELFAST, Ireland.—"*I have not seen a check-rein on a draft horse in Ireland.*"

GLASGOW, Scotland.—"As I wrote you about Ireland, so in Glasgow. *I have not seen a check-rein on a draft horse, nor on a horse used in any omnibus, hack, or other public conveyance*, and very few—*and none tight*—on other horses."

"I talked, the other day, with the keeper of one of the largest livery stables in the city. He had over a hundred horses in his stable and he told me that he had never used a check-rein on one of them. I talked with an old Scotch stage-driver and he said: 'We dinna use them. You winna get half their power with them crimped up so.'"

LONDON.—"*Few check-reins on cab and 'bus horses here.*"

NAPLES.—"*Check-reins are not used here on cab horses.*"

VENICE.—"*I do not remember to have seen, in this whole country, a check-rein on a horse attached to a public conveyance.*"

PARIS.—"*Check-reins are used rarely on draft-horses here, and not much, and almost never tight, on hack-horses.*"

Prof. Pritchard, of the Royal Veterinary College at London, says:

"I would therefore say that, instead of preventing horses from falling, the check-rein is calculated to render falling more frequent. Other not uncommon results of its use are distortion of the windpipe to such a degree as to impede the respiration ever afterwards, excoriation of the mouth and lips, paralysis of the muscles of the face, etc. It is a useless appendage, supported only by fashion. I feel that, if this were more generally understood, numbers of excellent persons who now drive their favorites with check-reins would discontinue to do so."

Dr. Kitching, of York, another eminent English writer on the subject, says:

"*First.*—If a horse pulling a load has his head held in by a check-rein, he cannot throw his weight into his collar, and is hindered from giving his body that position which is the most natural and effective. He has to pull by the strength of his muscles only, the weight of his body is lost, and so much pulling strength thrown away. What remains is exerted at a great expenditure of the horse's powers and health, to say nothing of his comfort. The consequence is, that his limbs and muscles become strained and distorted. His knees are bowed forward and his hocks backward. If a man pulls a load by a strap across his shoulders, he bends his head and chest forward and relieves his legs; a horse does the same when he can, and ought always.

"*Second.*—It injures the horse not only in the way described, but the confinement of the head in a constrained position, whilst the heart and lungs are excited by work, hinders the breathing, and the circulation of the blood in the head. These effects make the horse uncomfortable, and he becomes restless and irritable; in fact, his head aches and pains him, and he gets many a violent jag and blow, just because his driver cannot understand the cause of his restlessness. I have seen many horses standing at public house doors and other places, in this uneasy state, and by and by set off, in their desire to get home and be unharnessed, when the driver has rushed out and punished the horse for his own error.

"*Third.*—The check-rein inflicts unceasing torture upon the animal in another way. By holding the head upwards it puts the muscles of the neck on a constant strain. They become painfully uneasy and tired. If the horse cannot bear it he rests the weight of his head upon the rein, and his mouth is violently stretched. Thus he only exchanges one torment for another. I am not making fancy sketches: every word of my description is true. I have seen many splendid and valuable horses, worthy of a better fate, tossing their heads incessantly, and champing their mouths into a foam, from the intolerable uneasiness of this cruel check-rein. To sum up in a word: the check-rein lessens the horse's strength, brings on disease, keeps him in pain, frets and injures his mouth, and spoils his temper."

COMFORT.

Mr. Fleming, Veterinary Surgeon of the Royal Engineers (London), says:

"I think nothing can be more absurd than check-reins. They are against reason altogether. They place the animal in a false position. The horse stands with a check-rein exactly as a man would stand with a stick under his arms, behind his back, when told to write. It is extremely cruel, also. I have no doubt if the public could only realize the fact that it throws away a large portion of the horse's power altogether, and is very cruel besides, this rein would be discontinued. It is not only the head that suffers; but from his head to his tail, from his shoulder to his hoof, and over his whole body, he suffers more or less."

Another eminent English authority, John Adam McBride, Professor of Veterinary Medicine and Surgery in the Royal Agricultural College, says:

"I most heartily concur in what has been written by Prof. Pritchard and Dr. Kitching as to the bad effects of the foolish custom of using the check-rein.

"Prof. Pritchard has stated that the check-rein is a very common cause of 'roaring' in the horse, which statement is endorsed by all veterinarians.

"I will briefly consider the effects of the check-rein: (1) upon the circulation of the blood; (2) upon the veins; (3) upon the arteries.

"1. *Its effects upon the circulation of the blood.*—It will appear very evident that this contrivance must seriously interfere with the return of blood *from* the brain, and thus lead to an accumulation of venous blood, producing eventually a state of coma, the severity of which will depend upon the duration and intensity of the compression; and, further, it must impede the flow of arterial blood *to* the brain. This deficiency of arterial blood is characterized by a want of nervous sensation, and a disarrangement of the nervous parts.

"2. *Its effects upon the veins.*—The sudden, intermittent, and violent muscular action of the neck, together with pressure of the lower jaw, would induce more or less permanent distention of the veins, which in all probability would ultimately become varicose.

"3. *Its effects upon the arteries.*—The pressure of the blood within the vessels, and the unnatural muscular contraction of the neck, would lead to laceration of their inner coats, resulting in enlargement of the vessels, and thus form aneurisms.

"The consequences of the above conditions would lead to increased pressure upon the nerves of the neck, causing pain to the animal, and, further, it would predispose the unfortunate victim of fashion to such diseases as megrims, apoplexy, coma, inflammation and softening of the brain."

Hon. Chas. L. Flint, Secretary of the Massachusetts Board of Agriculture, in an address delivered at Boston Music Hall, March, 1869, says:

"There is another point on which I should like to make a single remark: I allude to the prevailing use of the check-rein upon our draft and team horses . . . If a man has a hard day's work to do, if he wants to exert his muscles and sinews, he must have those muscles free and unconfined; nobody who has tried it can deny that; and yet how does it happen that a principle that every farmer, every mechanic, every laboring man of any character, would admit in his own case, is so constantly disregarded in the case of the hard-working and often ill-used horse? And yet you see it every day.

"I have many times seen a team overloaded with coal tugging up yonder Beacon Hill, straining every nerve, often plied with the lash, and sometimes with the toe of a cowhide boot, while the power of the too-willing horses was crippled by a useless and senseless check-rein. Some of you may have read a little work called 'Bubbles by an Old Man,' by Sir Francis Head, a distinguished soldier who had galloped across the pampas of South America, and seen those vast droves of untamed horses in their native wildness and freedom, and so was a good judge of the natural conditions under which the horse exerts his strength to the greatest advantage. In that little work he contrasts the practices of different nations in regard to the check-rein, and points out clearly that when a horse has real work to do—whether slow work, as in our ploughs and carts, or quick, as in galloping, or in the headlong flight across the plain—nature tells him not to throw his head up and backward, towards his tail, but forward and down, so as to give the force of his weight into what he is called upon to do. He shows that nature never intended a large and heavy animal, like a draft-horse, to perform his slow work only, or chiefly, by the strain of the muscle; but, on the other hand, by the power of weight as the rule, assisted by the strength of the muscle as the exception, when extra resistance is to be overcome.

"And what is the use of a check-rein on a draft or a team horse, anyhow? There may be a necessity for it in some young, unbroken, or ill-tempered animals; but these are the exceptions. On most of our heavy team horses it can rarely be justified. If it be said, to prevent them from falling, it may be said in reply that it has quite as often prevented an old horse from recovering from a stumble. It is to be hoped that horse owners will look at this matter in its true light."

The foregoing are only a few of many European and American authorities, which I have found to the same effect, and I have searched the books in vain for a single line to the contrary.

I can only conclude, as the result of my examinations, that the custom of tying up horses' heads with check-reins, like the custom of bleeding calves before they are killed, is a relic of barbarism, contrary alike to common sense and scientific opinion, and which has been permitted to exist so long because it has been nobody's business to call public attention to it.

NATIONAL AID TO ROAD BUILDING.

By Gen. Roy Stone, of New York.

THAT "relic of barbarism," whose name is mud, remains with us, shadowing all the land; but the people are rising in wrath to bury it if they can. Our law makers will have presently to face the greatest problem of their lives; if they turn their backs on it "the places that know them now may know them no more forever." It is useless to nibble round the edges of the difficulty, to lecture the farmers, abuse the road masters or beseech the state legislatures; nothing comes of all this. The remedy must be as radical as the disease is deep-seated. Our people have discovered that all over the world roads are among the prime concerns of national governments, and they ask themselves what fatal disability has fallen on our own Government in the last half century that makes our statesmen shudder at the mention of national roads or national aid to road making.

GEN. ROY STONE.

The failure of the House of Representatives to pass the Senate Bill for a National Highway Commission leaves us still without adequate means of obtaining information regarding highways in the United States, and the subject that is most interesting to the public at this time is hopelessly obscure.

The investigations made by our State Department abroad and the wide discussion of the subject at home have, however, at least made it clear that this is the only civilized country in the world without good roads, and that the want of such roads is not only a grievous tax upon the whole people, but the greatest hindrance to their progress, intellectual, social, moral and political.

In default of an official inquiry, we can only guess at the money value of this tax, at the extent of roads needed to give relief from it and at the expense involved; but it is needful to make some estimate of these, in order that we may determine whether relief is possible (which many doubt), and, if so, where we are to look for the means and what authority should control the work.

Data for such an estimate are scarce and uncertain; but in the State of Illinois the money loss by bad roads to farmers alone is estimated on good authority at $16,000,000 per annum. This of course is not the whole tax, since the people in town bear their full share in loss of trade and increased cost of living, but it will be a safe basis of calculation, and at this rate the total loss for the United States would approximate $300,000,000 per annum.

The average earnings of capital in this country may be taken as about three per cent., at which rate $300,000,000 is the interest on $10,000,000,000, or one-sixth of the entire wealth of the country.

Within this limit of cost, then, it will be profitable to build roads, provided the money can be obtained at the rate named, and that the amount will suffice to build the roads required.

Here again we lack information. No one knows what extent of roads we have, what it costs to keep them in dis-"repair," nor what it would cost on an average properly to rebuild them. We may assume, however, that road mileage is somewhat in proportion to population, and, taking the ratio of these in a known township, viz., three miles of road to one hundred people, and the total population outside of cities at 45,000,000, we would have in the settled portions of the United States 1,350,000 miles of roads (so called).

Of these it is safe to say we need to rebuild a million miles. What this will cost depends largely upon the decision of the question whether it is to be done through local effort or with the economies due to organization under a national system. Under the most favorable conditions the cost will probably average $4,000 per mile, amounting to $4,000,000,000 in all, and leaving a profit of $6,000,000,000 to be realized by the country at large out of the enterprise. But can so vast an enterprise, however promising, be prudently executed; and can it be financed without oppressing the people or shaking the money centres of the world? The first question involves again the control of the work, whether it is to be local or national, and on this point we have some useful lessons in every day experience. For example, the road supervisors of the country are supposed to expend in one way or another about $75,000,000 yearly; the United States Post Office Department expends an equal sum and in ways more diverse and difficult of control. In the one case we have a well organized national bureau and an economical expenditure of the money, in the other no organization nor method, and the expenditure is almost an utter waste. What is true of the post office is equally true of the army and navy, the revenue service, the coast and geological surveys and the permanent public service generally; and while there may be unwise legislation for rivers, harbors and public buildings, the execution of the work on them is in the main honest and efficient. It is safe to say, then, that under national authority the work can be done with a reasonable degree of economy.

The financial question is a deeper one, with less light from experience, but some things about it are plain: It is impossible to raise this amount of money by taxation; it is unjust to raise it on short loans and compel one generation to bear the burden of a work that is for all time, and it is the height of folly to use the lowest form of the public credit and pay a high rate of interest when the highest form and a low rate are at our command. These considerations point as clearly to national financing as the economic ones do to national control.

Long loans at low rates are only possible through the national credit. Counties could borrow limited amounts on short time at about double the national rates, but their bonds would be a drug in the market before the work was well begun. The states could do a little better; but their varying credit would impose unequal burdens upon the people, while those most needing the improvement would be least able to secure the means. Another and fatal objection to state financing and control, in New York at least, was found last Winter when the friends for an excellent bill for state roads abandoned it in disgust because they could not pass it with a non-partisan commission, but must make it wholly tributary to the machine in power and add its millions to a compaign fund.

Even with national financing there are dangers and difficulties to be met in so vast an undertaking. A sudden change from a decreasing to an increasing national debt, with no certain limit in sight, would shake even our own high credit. If, however, instead of increasing its own debt the nation could accomplish the same result by giving its guaranty to local debts, and could be protected by solid security against any ultimate loss through that guaranty, the national credit would probably not suffer more, through the contingent liability incurred, than it would gain by the resulting increase in national wealth, while the local communities would get the full benefit of the present high standing of the nation in the money markets of the world.

On what basis could such an arrangement be effected? In the national road building which occupied the attention of Congress for the first third of this century, and which preceded national river and harbor improvement by nearly twenty years, the Government paid the entire cost, and built trunk lines of road only. If national work were now to be resumed, the changed conditions would dictate another line of policy. The railroads serve the purposes of trunk lines, and the interests of the Government is in the general improvement of local roads for postal and military uses and the "general welfare," and its policy should be to stimulate local effort by means of the least modicum of national aid, so administered as to be of the most effect.

To avoid local jealousies and log-rolling legislation, this aid should be offered freely to all who will accept its conditions.

As to these conditions, let us suppose that the nation, state, county and township are found to be equally concerned, and they agree to contribute, each one-fourth, to pay the interest and sinking fund charges on an issue of county bonds for road improvement; that the work is done under their joint supervision; that the bonds are guaranteed first by the state and then by the United States; the sinking fund placed under government control; the amount of bonds limited to a fixed percentage of the value of real estate in the county as determined by a national assessment, and finally, if necessary, the roads themselves mortgaged to the United States as security for its guaranty, with power to take tolls in case of local default. With these safeguards the nation would seem to risk nothing, while giving the full benefit of its unimpaired credit to the counties and states.

These bonds could be made available as security for the circulation of national and state banks and for the investments of postal and other savings institutions, insurance companies, estates and trust funds generally. This would open an immediate demand for them to the extent of a thousand millions or more, with a steady increase as the country grows, and they would probably bring a premium at two and one-half per cent. interest and be marketable as fast as the money was needed.

A sinking fund of one-half of one per cent. per annum invested at two and one-half per cent. would repay the principal in seventy-two years, and the entire charge would be only three per cent. per annum.

How heavily would this charge bear upon the several participants? An average rural township now pays a yearly road tax of ten to fifteen cents per acre of its area. One of six miles square, or 23,000 acres, at twelve cents per acre, pays $2,760. Such a township would require possibly fifty miles of road, costing $200,000. Three per cent. on one-fourth of that sum would amount to $1,500 per annum. This would leave, out of the present tax, $1,260 for repairs of roads, and that amount, $25 per mile, if well expended, would be quite sufficient to keep the new roads in good repair. It is stated by Mr. A. J. Cassatt, who is excellent authority, since he brings business method and a keen insight into the hazy field of country road work, that the cost of maintaining a good macadam road under the wear of rural traffic is not over $10 per mile yearly.

Under this arrangement, therefore, the township need not increase its present road taxes at all, and while the county and state taxes might increase temporarily, the burden would soon be removed by the increase in taxable values. The nation's annual share would be one cent per head on 75,000,000 people for each $100,000,000 expended; and when the whole work was done the national charge would barely equal the present annual expenditure for rivers and harbors.

The modern school of strict constructionists is adverse to any national aid to roads, but the recent wide-spread agitation is letting in new light on this subject, and the people only need to see the way clear to a practical method of reform and they will demand its adoption. On the constitutional side of the question it is clear that the power to build roads, heretofore exercised, includes the power to help build them; while the loaning of national aid and credit is a common practice and has extended to many projects less national in character. The essence of a national objective is "the general welfare," and in that regard road making stands pre-eminent. The tax of bad roads is more evenly distributed than any other. It falls alike on producer and consumer, but with especial weight on the poor in towns and cities who depend so largely on farm products for their subsistence. Road improvement would bring relief to every class. Moreover, the mere expenditure of hundreds of millions annually for labor and materials in the rural districts would give years of prosperity to the whole country more healthful and legitimate than could be had through any of the many schemes for national aid to the agricultural classes; while by a wise use of the means available, within the span of one long life, and almost without effort, the whole great work would be paid for, the debt cancelled, and the noble heritage of Good Roads left free to our children's children forever.

ELECTRICITY has recently been applied to establish the condition of a horse's foot. If the hoof has been pierced with a nail to the quick, the horse will feel the electric current and become irritated; in the other case the current cannot pass through the foot.—*Blacksmith & Wheelwright.*

TURN ABOUT IS FAIR PLAY.

A MERCIFUL man is merciful to his beast,"
But rules should work both ways, you will agree,
The horse I rode took fright and ran at least
Ten miles with me and shook me violently,
Egad, he showed no mercy unto me!

THE WHEELMEN AND THE PUBLIC ROADS

A Cyclist's Letter to his Wayback Uncle.

I.

Dear Uncle:

Some time ago you wrote me a letter in which you expressed in a mild way your disapproval of the prominence which the League of American Wheelmen has taken in the work for better roads. You said you thought it should be a movement of men and not of boys in order to attain success. You suggested that the public roads had an industrial value to the farmer and to the merchant, and that the gospel of good roads might be preached with better effect by a class of men who are not (to use your own expression) mere "proprietors of playthings."

My dear uncle, let me assure you in all soberness that in point of utility a bicycle is no more a plaything than is a cathartic pill. They are both used as remedies for various human ailments, and if the bicycle comes a trifle closer to the human affection, it is only because it supplies by means of air and exercise the same remedy for indigestion and torpid livers that is sought for in the more convenient and conventional pillbox. Of course I know that upon this point you will not agree with me at once, nor perhaps at all; but we are dealing with a plain text that can best be treated by the kind of plain talk that we both like, and whatever else may be the result I know you will read my letter with a feeling of thoughtful kindness, so that when I go up to the old farm next fall we may laugh over our little differences of opinion, and perhaps sift out the chaff from some of our ill-considered arguments and get back to a common understanding of things as we have done so many times before.

You know there is a curious perversity in human nature that makes us condemn new things and things that we know little about, and this is particularly true whenever the intrusion is of such a kind as to violate old methods and old traditions. I have heard you tell of the time when a gang of stupid farm laborers came up in the night from the Jacktown Flats and set fire to your barn because it contained a new patent thresher, and it has been truly recorded that the biggest fool of his day, in the estimation of his neighbors, was the man who carried the first umbrella. Railroads, telegraphs, sewing machines, knitting mills and every variety of commercial and agricultural machinery have been brought out in the face of bitter opposition, and not the least fierce and stubborn of this opposition came from the farmers of your county. They were all good honest people, but most of them who fought the improvements I have named have long since been laid away in the old graveyard, while their children and grandchildren have profited by the inventions they sought to destroy.

And so, if you may be brought to see that the bicycle is really a vehicle of great use and incalculable benefit to the human race, you will the more quickly concede that the men who use it are justified by a wisdom which, in this particular, has been superior to your own; and that the use of a bicycle in no way militates against either the reputation or the character of the rider, nor against the dignified position which, as your fellow citizen, he has assumed in his contention for the improvement of the public roads. Now let us see in what way cycling is entitled to a place in our common esteem.

II.

Do you remember when I came up to the old farm five years ago after a disastrous wrestle with typhus fever? You told me then that I was a likely candidate for the graveyard, and gave me some rugged advice which, as I now recall it, included some pertinent references to fried bacon and the wood pile; but I was never a champion at wood sawing nor over-fond of pork as a steady diet, and my poor wreck of a body at that time was in need of kinder treatment. My month of rest at the old place gave me legs to stand on, and I came back to the city on rather better terms with myself though by no means fit for work. Somebody advised cycling, and my plenty of time led me to think of it. A friend taught me to ride, and I found it marvellously easy. To me, bicycle riding had always seemed the peculiar accomplishment of an athlete. I had thought of it as one thinks of walking a tight rope, and when I found my naturally awkward, and at that time, intolerably weak body propelling itself about on a bicycle at the end of three short lessons, my surprise was only equalled by the pleasure of the new sensation and by the marvellous appetite and sound sleep which a little of this exercise induced.

Since that time I have had some years of happy experience as a wheelman, and have long been convinced not only that the bicycle is in the highest degree a useful and practical vehicle, but that cycling is a dignified, economical and helpful sport to all who will ride for pleasure ; while to thousands of worn and weary brain workers, whose hope for vigor is in the air and sunlight, it is a veritable godsend. If you could be sure of these things you would perhaps grant that some reason exists why so many excellent and brainy people have risked the condemnation of yourself and your Seedville neighbors, by pushing these pedaled vehicles over the execrable highways of your venerable town; and you might even admit that some slight justification is apparent for the arguments advanced by these wheelmen for the improvement of your roads. You have always looked upon cycling in a disdainful way, and have never seemed to give yourself much concern as to its history, its progress, or its condition; and I am therefore quite sure that I may write you in this letter a few things regarding the advantages of cycling without incurring the risk of repeating things that you already know.

About seventeen years ago a medical officer in the Royal Navy of Great Britain* came back from service in India, only to find himself prostrated by chronic rheumatism, which soon compelled him to quit the service. Writing later of his own experience, he says: "I took to literature as a profession. There was no healing power in that, but I shortly took to cycling. My rheumatism used to come on periodically and last for six weeks at a time, during which I could hardly stand on the floor, nor sleep in bed without feet and legs elevated. Since I adopted cycling as an exercise, and thus found pleasant means to keep my skin in perfect working order, I have never had a single twinge of rheumatism. . . . . Cycling has banished my pains and lightened my mind, and made me physically and mentally double the individual I was that mournful morning when I left Haslar Hospital leaning on a stick."

III.

I cite this testimony of Dr. Stables, not because his was the most remarkable or most conspicuous case in which cycling has brought health to the human body, but rather because of the kind of evidence it contains, strengthened as it is by the high character of the witness and his eminent professional knowledge of the needs and remedies which serve best in the cure of human ailments. Indeed, I might tell you of a thousand cases in our own country in which men well advanced in life, and worn by the exacting cares of business, have found in cycling a panacea that has brought new health and strength when drugs and physic had accomplished nothing beyond the results of failure and despair. You know there is an old saying that "life is not to live but to be well," and if you will think a moment you will probably conclude that your own rugged health is in no small measure due to the pure air and bright skies which surround you and your home. You will admit that thousands of good people are denied the happiness which belongs to farm life, and have no ready means, within the lines of their vocations, by which they can keep pace with you in the matter of that muscular condition upon which their health so much depends; and so it is that a great many people who are not farmers have become wheelmen, and this may be also one reason why farmers, as a rule having no need of air and exercise beyond that which comes in the course of their daily work, have not come to appreciate cycling as a health-giving means of recreation.

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* W. Gordon Stables.

No other vehicle has ever been so thoroughly discussed and none so widely commended as the bicycle. Its praises come from men of judgment, thought, experience and reputation. That grand old philosopher, Gladstone, who has just been again made the Prime Minister of England, a little while ago gave expression to his views on the subject of cycling by saying that he believed it to be of untold value to the people of his country, both as a means of exercise and because of the usefulness of the bicycle itself. Perhaps you will be interested if I quote some of Mr. Gladstone's language. He says:

"I have noticed with real and unfeigned pleasure the rapid growth of cycling in this country, for not only does it afford to many to whom it would otherwise be unobtainable a healthy and pleasurable form of exercise, but it also enables them to derive all those advantages of travel which, previous to the advent of cycling, were out of their reach. Of the bodily good derived from so manly and healthy a form of exercise, of the blessing it bestows, helping to maintain a sound mind in a sound body by the relaxation from the desk or counter, of the recreation in the open air, of the energy it calls into play, I need hardly speak. I can only emphasize the fact that I consider that, physically, morally and socially, the benefits cycling confers on the men of the present day are almost unbounded, and this belief I endeavor to act up to by heartily welcoming and assisting, so far as in me lies, the many cyclists who come to visit Hawarden and see the grounds."

Mr. Gladstone's means of observation have been very extended, for England has been, for many years, the great cycling centre of the world. It is safe to say that the wheelmen in Great Britain to-day are little less than half a million in number, while in our own country their number is multiplied at an astonishing rate. They include thousands of editors, clergymen, lawyers, physicians, merchants and men engaged in all the various pursuits of life, and all these people without exception bear witness in favor of cycling.

A little while ago a prominent American clergyman* said: "I haven't spent a dollar for a doctor since I had a bicycle. That is a good argument for the bicycle, but it is hard on the doctor."

I could fill many pages of my letter with testimonials of this kind from our leading newspapers and from prominent men in every state of the Union, but I fear I have already taxed your patience by too many quotations and may only hope for your indulgence by reminding you that I am only laboring for that eternally justifiable end, the establishment of a fact; for facts are stubborn things, and if we can get to a common understanding of the facts of cycling I am confident that most of our differences will be forever dispelled.

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* Rev. George F. Pentecost.

(*To be continued.*)

DIRT ROADS AND GRAVEL ROADS.

By Isaac B. Potter.

VII.

GRAVEL ROADS—THE DRAINAGE OF GRAVEL ROADS—GRAVEL SURFACE AND STONE FOUNDATION—BINDING MATERIAL—MAINTENANCE.

Gravel Roads.—Aside from the cleanly appearance of a good and well compacted gravel road and the agreeable sensation always experienced by one who drives over it, it has a distinct advantage over the ordinary dirt road in point of usefulness; for the force required to haul a given weight over the common dirt road is generally about forty per cent. greater than would be sufficient to haul the same load over a well made gravel surface.

But what is gravel? This question put to a dozen country "pathmasters" would be certain to bring forth a variety of answers, most of which would be more or less amusing, and none of which would probably be very accurate. Last Summer, while passing through one of the interior counties of New York, I was asked by one of the farmers residing there to pass judgment upon the quality of a "gravel bank" which he had opened in the side hill not far from his barn. He said that he and his neighbors had been using it to repair the public road and that the results had not been altogether satisfactory. We walked around to the "gravel bank" and there I found a great mass of fine earthy matter through which might be seen in irregular streaks, stones and boulders of various sizes, but from the standpoint of a practical roadmaker nothing could be seen which in any way resembled gravel. I told my friend that the quality of this gravel bank could be determined by a simple experiment; and, acting upon my advice, he filled a good sized wooden box with this material and hauled it over to the spring, where it was placed under the outlet of the drain pipe and a stream of water permitted to pour into the box during the night. In the morning the box was found to be about one-third full of various sized cobble stones and boulders, which, with a few small traces of gritty material at the bottom, was all that remained of the "gravel" put in the night before. The water had washed out all of the soft, light, earthy material, the mud-making portion, and had left only the stones, which, in their natural condition, were as unsuited for road-making as the soft dirt itself.

A good gravel road surface can generally be told by the sound of the wheel tires as you drive over it. There is a crisp, gritty sound, more or less distinct as the condition of the road varies, but ever present on a good gravel road, which, to the close observer, will fairly indicate its quality and in a measure vouch for the integrity of its maker. Good gravel is never improved by the addition of loamy soil or soft, earthy materials, though it is sometimes necessary in cases where creek and riverside gravel is used, to offset the smooth, rounded and worn surfaces of the stones by the addition of a light binding material. This should, however, be sparingly applied and well rolled into the surface layer, as will be hereafter described.

In cases where pit gravel is the only available material, it is best to employ one or more wire screens for the separating of the different sizes of stones from each other and from the earth with which they were originally mixed. All stones and pebbles which are too large to pass through a screen having 1¾-inch openings should be rejected or run through the crusher. A second screening through a screen with ¾-inch openings will further separate the different sized stones, while the finer material which passes through the smaller screen may be used to form a rolled sub-grade, or employed as a binding material wherever this may be needed.

In the construction of a gravel road, after giving attention to the location, grade and alignment in the same manner as I have recommended in the case of dirt roads, the work of construction becomes quite simple. It will be necessary in most cases to excavate to a depth of about eight inches for the full width of the proposed roadway, giving each side of your excavation a nearly vertical slant, so that it will hold the gravel and prevent caving and sloughing off at the sides. The bottom of this excavation should be given a gradual slope each way from the centre outward to correspond with the outline adopted for the finished roadway. When the excavation is done it will be better and will certainly insure a more permanent road if the sub-grade or bottom of the excavation can be rolled with a roller of from three to five tons in weight, and upon some soils even a much heavier roller might be used to advantage. Rolling is not, however, really essential to the construction of a good gravel road, and while it is always desirable and generally cheaper to roll both the sub-soil and the gravel layers which compose the upper surface, the absence of a roller may not be seriously regarded where the sub-soil is firm and likely to maintain its condition of hardness. In such case a layer of say five inches of good gravel (not necessarily the best; unscreened gravel, if of fair quality, may be used for this bottom layer) may now be put in and raked into an even layer over the entire sub-grade, after which this gravel layer may be subjected to the wheels of passing traffic till it becomes fairly compact. While this process is going on it will be necessary to keep the ruts and uneven depressions filled as fast as they are formed, and to this end you should use a sufficient force of men with rakes to keep the surface raked smooth and the depressions filled till the road has become fully and smoothly consolidated by the wheels of passing traffic. In ordinary cases one man will be sufficient to care for 1,000 to 1,500 feet of road, say 12 feet wide, during this process of compacting the top surface.

If you use a roller, remember that the sides of the roads should have your first attention, and that the work of compacting the layers of gravel should proceed from each side towards the centre so as to counteract the tendency of the gravel to work out from the centre towards the sides. The work of rolling will generally go on more quickly and thoroughly if the gravel is slightly moistened in advance of the roller, and this is particularly important in putting down the top or surface layer.

The Drainage of Gravel Roads.—Ample and well-formed side drains should always be provided for gravel roads, and where the natural soil is of a soft, wet nature, one or more centre drains will be found of the greatest advantage. Both the centre and side drains may be constructed on the same general plan recommended to be used in the construction of dirt roads. In this matter of under-drainage it is best to remember that in every road dryness and hardness generally go together; that the artificial layer of six or eight or more inches in thickness is put on, not to sustain the loaded wagons, but rather to endure the wear and to preserve uniformity of surface. The underlying earth is the real sustaining foundation, and if this is soft or insecure in any marked degree, both the road surface and the traffic will suffer, for these are both held and sustained by the earth bottom. With this fact in mind it is easy to see why the original soil upon which the road surface is laid should be kept in as dry and firm a condition as possible, and every danger by which this earth foundation may be softened or saturated with water should be carefully guarded against. For this reason I earnestly urge the employment of centre drains in all cases where the ordinary side drains are insufficient to clear the intervening soil of surplus moisture.

Gravel Surface on Stone Foundation.—Instead of making the separate layers entirely of gravel, the practice is sometimes followed of laying a foundation course of earth rubble, set somewhat after the manner of Telford foundation, though not generally with the same care, nor is it generally deemed necessary to preserve anything like the same regularity of courses. Upon the rough rubble bottom it is a common practice to spread a layer of broken stone, of which the separate pieces do not exceed one and one-half to two inches in largest diameter, and after this layer is properly spread, shaped and rolled, the gravel top is put on, moistened and rolled, the gravel being mixed with a binding material or not, as its nature requires. This plan is particularly recommended for suburban village streets where the traffic is not too heávy, and for country roads where materials are conveniently at hand. It makes a most excellent form of gravel road, smooth, durable and easily maintained, while in point of firmness it is preferred by some engineers to the Macadam and Telford forms. It has given excellent satisfaction in several parts of the United States and is substantially the same as recommended by City Engineer Mead, of Rockford, Ill., who found that gravel roadways in the section of that city are better than those of Macadam made with the stone found in that locality. I copy the following from the Rockford specifications:

"The streets shall be excavated or filled by the city to the grade given by the city engineer, and the surface prepared by said city for receiving the rubble.

"On the surface so prepared a layer of large-sized rubble shall be thrown. This course shall be arranged in a close and compact form, and the interstices of the larger stones shall be filled in with sound stone chippings, all to the satisfaction of the Commissioner of Streets. The stones for the foundation course shall be generally not less than five inches in any dimension.

"Over the foundation course a layer of rubble broken as nearly as possible to a cubical form, not less than one and one-fourth inches, nor more than two and one-half inches in any dimension shall be placed. The rubble shall * * * * be well compacted and rolled with the city roller, to the satisfaction of said Commissioner of Streets.

"Over the rubble a layer of screened gravel mixed with clay shall be placed. The layer shall be when finished at least two inches in thickness at the centre and one inch in thickness at the side. This layer shall be well rolled and compacted with the street roller to the satisfaction of said Commissioner.

"Both before and while rolling the rubble and gravel layers, said layers shall be flooded or sprinkled."

Binding Material.—I have already referred to the use of binding material as being necessary in cases where the gravel will not compact readily in its natural condition; but it is highly important that all earthy materials be excluded from the clean gravel except so far as may be necessary to insure the compacting of the surface. In case it is possible to get "hard pan" or blue gravel, a firm and durable road may be obtained by mixing this material with clean or well screened bank gravel, taking care to thoroughly roll the mixture when put on the roadway, keeping it sufficiently wet during the operation to insure thorough consolidation of the whole.

In rolling, any *good* roller will answer, but it is well to remember that the final rolling cannot be too well done and that a heavy roller should be used for the finishing work if possible. Good horse rollers may be obtained of several different manufacturers whom I have mentioned in a former chapter, or a very excellent roller may be made by home mechanics, though this is not always the cheaper way.

In Germany a simple roller was designed some years ago by preparing an iron cylinder closed at both ends and so arranged that it could be filled with water whenever heavy rolling became necessary. When not in use, and to move the roller from place to place, the cylinder was emptied and of course made much lighter. In dimensions this roller was about seven feet in diameter and about five feet in length, and was arranged to turn in a simple frame to which horses where hitched in front.

Maintenance.—No road can be properly maintained except by a system of constant repair, or rather that continuous attention which looks to the repair of all defects in the surface as fast as they appear. No greater fallacy was every promulgated than that involved in the system of "annual repairs" which obtains in our country districts, and which has turned out to be a kind of shiftless, make-believe tinkering that takes hold of the road in the dry season when it is in fairly good condition, and fills it with great heaps of soft dirt, stones, sod and refuse, making it nearly as bad as when softened by the spring rains. A good road surface will wear out by the action of travel. It is quite as perishable as the wagons we ride and the shoes we wear, and it would be as sensible to adopt a system of "annual repair" of shoes and wagons and to inaugurate an annual horse-shoeing "bee" as to continue in our present method of repairing the country roads only at a convenient season of the year, without reference to their needs and conditions during the trying seasons of Spring and Fall. Dirt roads and gravel roads may be kept in fairly good condition by placing a given length of road (say one-half mile) in charge of an intelligent laborer and holding him responsible for the condition of the road in his "section" at all times. To make this work of repair easy and thorough, good gravel or broken stone should be placed in convenient heaps along the roadside, from which it may be readily taken in wheelbarrows or light carts and placed upon the road at the points where repairs are needed. The cost of keeping the road in good repair by such a system would be much less than by the present inadequate method, while the results have been shown to be infinitely superior in the case of the continuous method.

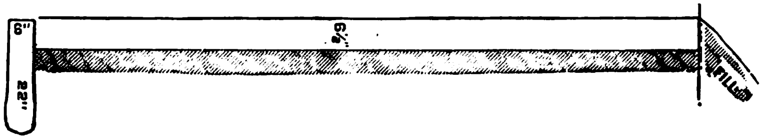
I. B. P.

THE END.

SIDEWALK IMPROVEMENT.

PLANS AND SPECIFICATIONS ADOPTED BY THE CITY OF LOUISVILLE, KY.*

THE grading shall agree with the pitch and grade of the sidewalk, with a sufficient depth below the curb to admit the foundation, for the different kinds of pavements hereinafter described. Where there is embankment the side shall be sloped as much as may be necessary to sustain the pavement in its position.



SUB-GRADE FOR BRICK PAVEMENT.

Curbing.—Dividing the sidewalks and carriageways, and supporting the former, there shall be laid a line of curbstones not less than six (6) inches in width, and each stone shall be at least five (5) feet in length. The curbstones shall be at least twenty-two (22) inches in depth. They shall have a full, square joint not less than twelve (12) inches deep. The curbstones shall be cut with a draft around the top, face and back, and the exposed top and front faces shall be neatly hammer-dressed to an even, regular face; the upper face to have the same bevel as the sidewalk, the front face to be cut not less than ten (10) inches deep, and the back not less than three (3) inches from the top. The bottom of the curbstone shall be parallel with the top, must have a firm, uniform bed, and no underpinning will be allowed. The remainder of the front face shall be scabbled or dressed evenly from the bush-hammer work to the bottom to admit a close joint with the gutter pavement. Curbstones shall be of good, hard, sound stone, free from flaws, dry seams or cracks. There shall be corner-stones at the intersections of all streets and alleys. Those on streets shall have a top face of the fourth of a circle of twenty-four inches radius, and on alleys eighteen inches radius, dressed to bevel with the sidewalk, the front face, back and joints to agree with the adjoining curb. All curbstones shall be laid true to line and grade. The space between the curb and the excavation shall be filled with earth. The filling shall be well rammed, and work shall be done according to plans.

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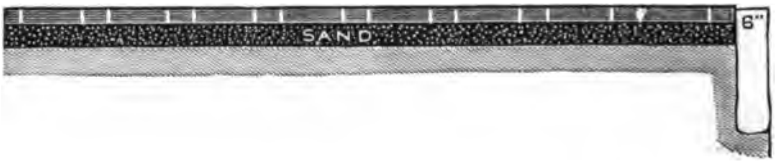
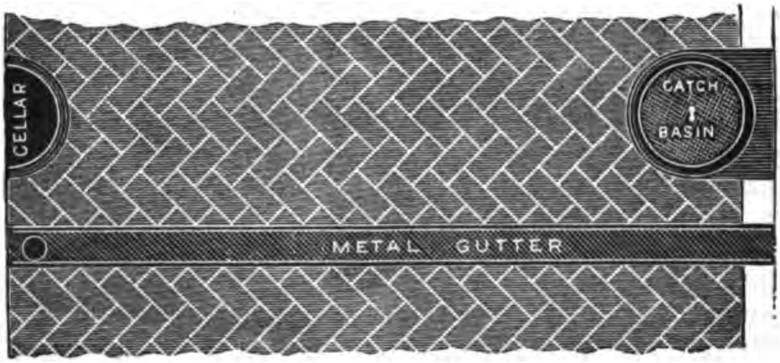
*Prepared by Chas V. Mehler, City Engineer.

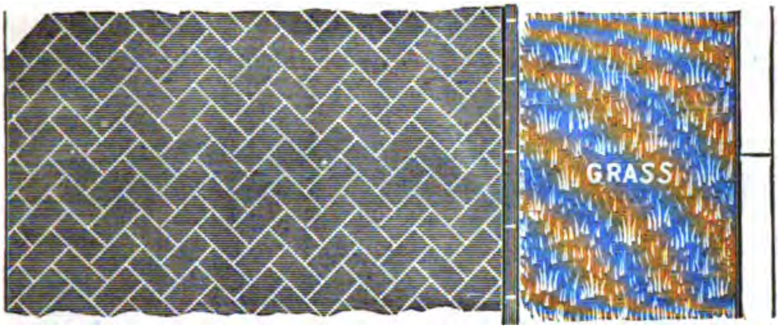


CROSS SECTION OF BRICK PAVEMENT.

Brick Pavement.—The brick pavement shall be formed of good, sound, hard-burned, whole paving brick, and laid closely and compactly together on a bed of sharp sand or gravel (with no gravel-stones larger than one-half (½) inch in diameter), four inches in depth. The pavement shall be laid with the usual bond (herring-bone) and properly fitted to the fixtures in the sidewalk. (See plans.) No broken, irregular-formed, or soft brick shall be used. When laid to the satisfaction of the City Engineer or his assistant, the pavement shall then be covered with clean, sharp sand, which shall be thoroughly swept into all joints. The pitch of the sidewalk when finished shall be three-eighths of an inch to one foot, the outer edge being raised one-half inch above the level of the curb. All clippings shall be carefully and neatly done. After the pavement

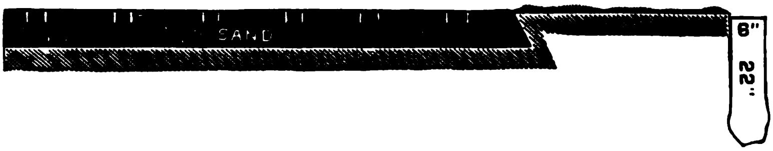


PLAN OF BRICK PAVEMENT, "HERRING-BONE" STYLE.



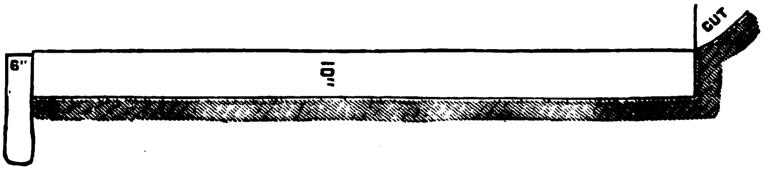
PLAN OF BRICK PAVEMENT, 8 FEET FROM PROPERTY LINE.

has been finally inspected it shall be covered with at least one-half inch of clean, sharp sand.



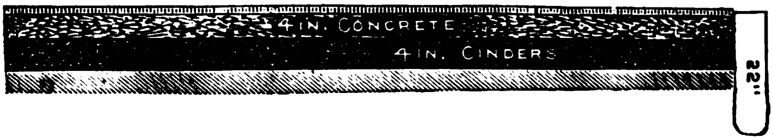
CROSS SECTION OF BRICK PAVEMENT, 8 FEET FROM PROPERTY LINE.

Cement or Artificial Stone Pavement.—The sub-grade shall be ten (10) inches below the surface of the pavement when completed. After the sub-grade (prepared as required) shall have passed inspection, there will be laid to the depth of five (5) inches, a bed of cinders, free from dirt and trash, which shall be sprinkled with water and compactly rolled or rammed to the satisfaction of the City Engineer or his assistant. Upon this bed of cinders will be laid a layer of concrete four (4) inches deep. The concrete will be made as follows: One measure of cement, equal to the best quality of freshly-burned Louisville cement, and two of clean, sharp sand, will be mixed thoroughly dry, and then made into mortar with the least possible amount of water;

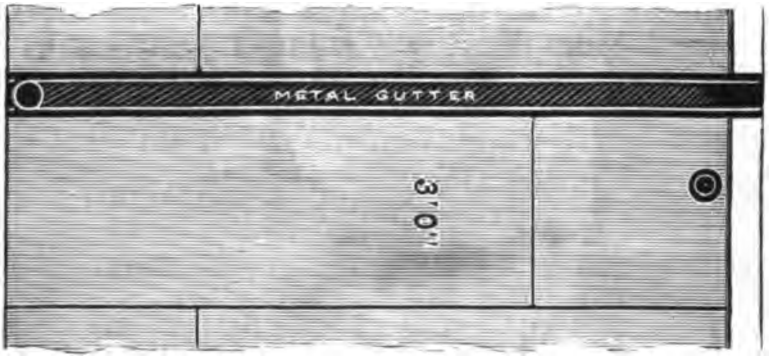


SUB-GRADE FOR ARTIFICIAL STONE OR HEXAGON BLOCK PAVEMENT.

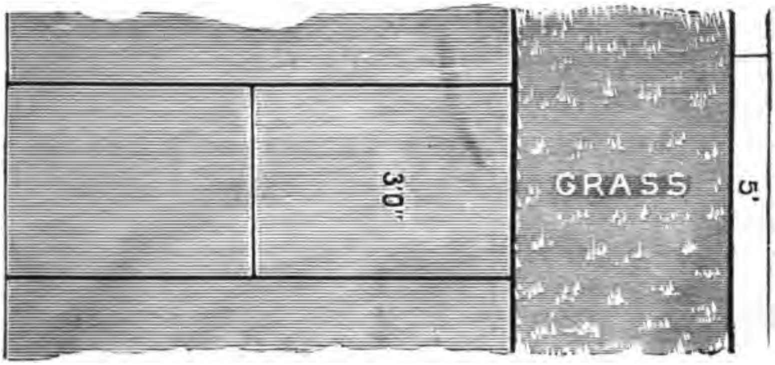
broken stone, brick or gravel, thoroughly cleansed from dirt, drenched with water but containing no loose water in the heap, will then be mixed immediately with the mortar in such quantities as will give a surplus of mortar when rammed. This proportion, when ascertained, will be regulated by measure. Each batch of concrete will be thoroughly mixed. It will then be spread, and at once thoroughly compacted by ramming until free mortar appears upon the surface. The whole operation of mixing and laying each batch will be performed as expeditiously as possible. The upper surface will be made exactly parallel with the surface of the pavement to be laid. The cement must be tested before it is used or accepted, according to the following: The cement used for constructing the concrete foundation must be of the best quality of uniformly burned, ground and settling cement. In fineness the cement must not be less than ninety (90) per cent. when tested through a sieve of twenty-five hundred (2500) meshes per square inch, and must bear a tensile strain of fifty (50) pounds per square inch, after having been mixed and exposed in the open air for twenty-four (24) hours.



CROSS SECTION OF ARTIFICIAL STONE PAVEMENT.

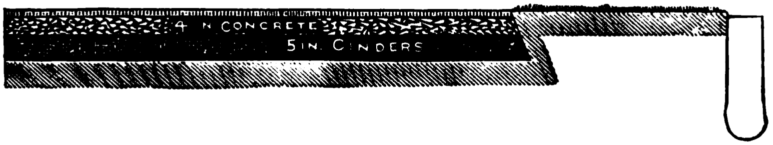


PLAN OF ARTIFICIAL STONE PAVEMENT.



ARTIFICIAL STONE PAVEMENT, 8 FEET FROM PROPERTY LINE.

After each batch of concrete is laid as required, it shall be immediately covered with the wearing surface, composed of the best imported Portland cement (English or German), one (1) part, and clean, sharp sand, two (2) parts, thoroughly mixed dry and made into a mortar with the least possible amount of water, which shall then be evenly and compactly spread to the depth of (1) inch upon the bed of concrete as prepared above, and finished to a smooth, even surface, and shall immediately thereafter be cut through to thé cinder-bed, making the appearance of blocks. (See plans.)

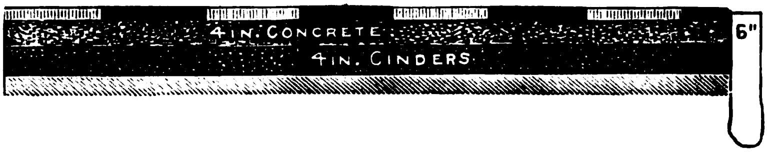


CROSS SECTION OF ARTIFICIAL STONE PAVEMENT 8 FEET FROM PROPERTY LINE.

The pavement shall be properly fitted around all fixtures in the sidewalk, the edges of the pavement to be beveled from top surface to bottom of concrete with same material used for the wearing surface. (See plans.)

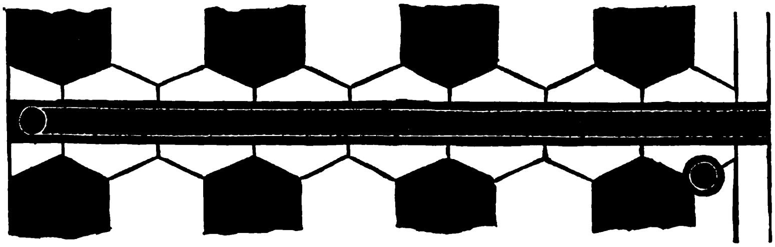
The pitch of the sidewalk when finished shall be three-eighths of an inch to one foot, the outer edge being raised one-half inch above the level of the curb

Artificial Stone Hexagon Block Pavement.—The sub-grade shall be ten (10) inches below the surface of the pavement when completed. After the sub-grade (prepared as required) shall have passed inspection, there will be laid, to the depth of four (4) inches, a bed of cinders, free from dirt or trash, which shall be sprinkled with water and compactly rolled or rammed to the satisfaction of the City Engineer or his assistant.



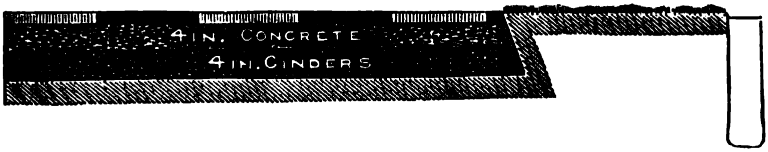
CROSS SECTION OF HEXAGON BLOCK PAVEMENT.

Upon this bed of cinders will be laid a layer of concrete four (4) inches in depth. The concrete will be made as already described in these specifications. Upon this layer of concrete will be laid the wearing surface (hexagon block) not less than two (2) inches in thickness, to be made as follows: The lower one inch of said hexagon block shall consist of one part of imported Portland cement (English or German) and two (2) parts of clean river sand or washed pit sand, which shall be thoroughly mixed dry, and then made into mortar with the least amount of water possible, and then tamped in an iron mould made in hexagon shape; the upper one (1) inch of the hexagon block shall consist of one (1) part imported Portland cement (English or German) and one (1) part of clean river sand or washed pit sand, thoroughly mixed dry, and then made into mortar with the least amount of water possible, which shall then be spread upon the lower one (1) inch as above prepared, and thoroughly tamped and finished to a smooth and even surface.

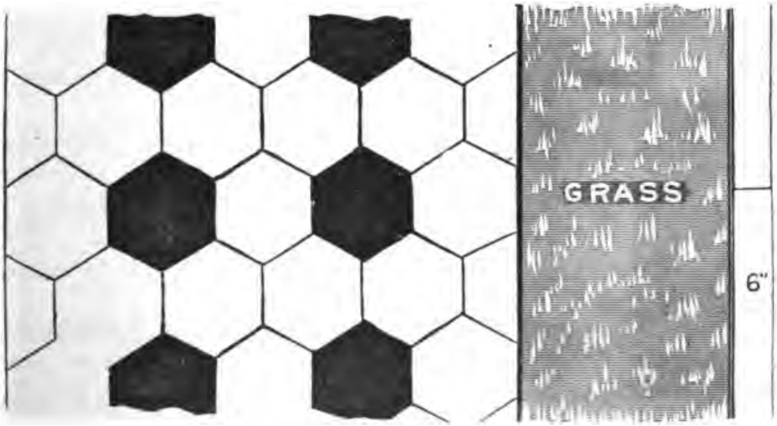


PLAN OF HEXAGON BLOCK PAVEMENT.

The pavement shall be formed of good, sound, whole blocks, and laid closely and compactly together; no broken irregularly-formed blocks shall be used. The pavement shall be laid in two colors, as shown on plans Nos. 12 and 14, and properly fitted to all fixtures in the sidewalk. After the blocks have been laid, all joints shall then be thoroughly filled with cement grout, made of one (1) part imported Portland cement and one (1) part fine, sharp sand, well mixed dry and then made into grout, with sufficient water to allow all joints to become well filled. The edges to be beveled from top surface to bottom of concrete with cement mortar, same as used in making wearing surface of blocks. (See plan.) The pitch of the sidewalk when finished shall be three-eighths of an inch to one foot, the outer edge being raised one-half inch above the level of the curb.



CROSS SECTION OF HEXAGON BLOCK PAVEMENT, 8 FEET FROM PROPERTY LINE.



PLAN OF HEXAGON BLOCK PAVEMENT, 8 FEET FROM PROPERTY LINE.

All drainage from house-pipes and water-ways shall be by covered iron gutters of approved patterns, properly set upon a bed of gravel six (6) inches in depth. Their top or cover shall be on a level with the top surface of the pavement, and securely fastened.

All sidewalks in front of the property of any person or persons, whose business necessitates the crossing thereof with wheeled vehicles, shall have a roadway either of two rows of stone flagging the entire width of the sidewalk of suitable distance apart, or of granite block pavement, or vitrified brick. When flagging is used, each stone composing the flagging shall not be less than four (4) feet long, eighteen (18) inches wide, and ten (10) inches deep, and the space between the flagging shall be paved with granite blocks or vitrified brick. Where granite blocks are used, they shall be laid on a bed of clean, sharp gravel, six (6) inches in depth, and shall be of the following dimensions: From seven (7) to twelve (12) inches in length, three (3) to five (5) inches wide; and from six (6) to six and one-half (6½) inches in depth. After the blocks are laid they shall be covered with clean, sharp sand, which shall be swept until all the joints become filled therewith; the blocks shall be then thoroughly rammed to a firm, unyielding bed, with a uniform surface to conform to the grade of the sidewalk. It shall then be covered with a good and sufficient coat of not less than one and one-half inches in depth, of clean, sharp sand.

The vitrified brick must be hard-burned paving brick of uniform size, free from flaws, cracks or breaks, and shall be laid on edge on a bed of clean, sharp gravel six (6) inches in depth, closely and compactly together.

After the bricks are laid they shall be covered with fine, sharp sand, which shall be thoroughly swept until all joints are filled therewith, after which they shall be thoroughly rammed, with suitable rammers, to the grade of the sidewalk, and shall then be covered with at least one-half (½) inch of fine, sharp sand.

In repaving sidewalks such old materials as are suitable for paving may be used in front of the property where they were taken from, and in all cases the old material in the sidewalks belongs to, and may be claimed by, the property owners, provided they are removed by them on forty-eight (48) hours' notice being given in writing by the contractor.

Recurbing may also be done with old or new curbing. When the old curbstones have been inspected and found to fill the requirements of this ordinance in dimension and quality, they may be reset in front of the same property before which they were originally placed. And should they require moving out to make the sidewalk conform to the width required by ordinance, then the trench shall be carefully filled with such materials as the Engineer shall approve, and be well rammed and made secure and solid before any material is placed on it.

The contractor shall prosecute his work in a prompt and orderly manner, and, when required by the Engineer, shall discharge incompetent employees or workmen.

Should the contractor fail to execute the work in the time stipulated, he shall forfeit his contract and be entitled to no pay for the work done; but the time fixed for its completion may, on the written recommendation of the City Engineer, for causes deemed sufficient by him, be extended by resolution of the General Council, and the receiving and apportioning of the cost of any work by the General Council after the time when it should have been completed shall be regarded as an assent to the extension of the time named in the contract.

The use of the sidewalk, or any part of it, by individuals or the public, shall not entitle the contractor to pay for the work done by him, unless it shall be received by resolution of the General Council.

The contractor shall, at his own expense, keep his work in good repair during the twelve (12) months next after its reception by the General Council, and should he, in the opinion of the City Engineer, be tardy in executing this stipulation, the City Engineer may have the necessary repairs made at the expense of the contractor.

IMPORTANT.

The attention of all readers is earnestly directed to our offer of cash prizes for photographs of good and bad roads. See front advertising pages of this number.

A FAMOUS GHOST STORY.*

(*Concluded.*)

"WHAT! you believe it is all an imposture?—for what object?"

"Not an imposture in the ordinary sense of the word. If suddenly I were to sink into a deep sleep from which you could not awake me, but in that sleep could answer questions with an accuracy which I could not pretend to when awake—tell you what money you had in your pocket, nay, describe your very thoughts—it is not necessarily an imposture, any more than it is necessarily supernatural. I should be, unconsciously to myself, under a mesmeric influence, conveyed to me from a distance by a human being who had acquired power over me by previous *rapport.*"

"But if a mesmerizer could so affect another living being, can you suppose that a mesmerizer could so affect inanimate objects? move chairs—open and shut doors?"

"Or impress our senses with the belief in such effects—we never having been *en rapport* with the person acting on us. No. What is commonly called mesmerism could not do this, but there may be a power akin to mesmerism, and superior to it—the power that in the old days was called Magic. That such a power may extend to all inanimate objects of matter, I do not say; but if so, it would not be against nature—it would be only a rare power in nature which might be given to constitutions with certain peculiarities, and cultivated by practice to an extraordinary degree. That such a power might extend over the dead—that is, over certain thoughts and memories that the dead may still retain—and compel, not that which ought properly to be called the SOUL, and which is far beyond human reach, but rather a phantom of what has been most earth-stained on earth, to make itself apparent to our senses—is a very ancient though obsolete theory, upon which I will hazard no opinion. But I do not conceive the power would be supernatural. Let me illustrate what I mean from an experiment which Peracelsus describes as not difficult, and which the author of the "Curiosities of Literature" cites as credible: A flower perishes; you burn it. Whatever were the elements of that flower while it lived are gone, dispersed, you know not whither; you can never discover nor re-collect them. But you can, by chemistry, out of the burnt dust of that flower, raise a spectrum of the flower, just as it seemed in life. It may be the same with the human being. The soul has as much escaped you as the essence or elements of the flower. Still you may make a spectrum of it. And this phantom, though in the popular superstition it is held to be the soul of the departed, must not be confounded with the true soul; it is but the eidolon of the dead form. Hence, like the best-attested stories of ghosts or spirits, the thing that most strikes us is the absence of what we held to be soul; that is, of superior emancipated intelligence. These apparitions come for little or no object—they seldom speak when they do come; if they speak, they utter no idea above those of an ordinary person on earth. American spirit-seers have published volumes of communications in prose and verse, which they assert to be given in the names of the most illustrious dead—Shakespeare, Bacon—heaven knows whom. Those communications, taking the best, are certainly not a whit of higher order than would be communications from living persons of fair talent and education; they are wondrously inferior to what Bacon, Shakespeare and Plato said and wrote when on earth. Nor, what is more unnoticeable, do they ever contain an idea that was not on the earth before. Wonderful, therefore, as such phenomena may be (granting them to be truthful), I see much that philosophy may question, nothing that it is incumbent on philosophy to deny—viz., nothing supernatural. They are but ideas conveyed somehow or other (we have not yet discovered the means) from one mortal brain to another. Whether, in so doing, tables walk of their own accord, or fiend-like shapes appear in a magic circle, or bodyless hands rise and remove material objects, or a Thing of Darkness, such as presented itself to me, freeze our blood—still I am persuaded that these are but agencies conveyed, as by electric wires, to my own brain from the brain of another. In some constitutions there is a natural chemistry, and those constitutions may produce chemic wonders—in others a natural fluid, call it electricity, and these may produce electric wonders. But the wonders differ from Normal Science in this

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*"The House and the Brain." By Edward George Bulwer: Lord Lytton.

—they are alike objectless, purposeless, puerile, frivolous. They lead on to no grand results; and therefore the world does not heed, and true sages have not cultivated them. But sure I am, that of all I saw or heard, a man, human as myself, was the remote originator; and I believe unconsciously to himself as to the exact effects produced, for this reason: no two persons, you say, have ever told you that they experienced exactly the same thing. Well, observe, no two persons ever experience exactly the same dream. If this were an ordinary imposture, the machinery would be arranged for results that would but little vary; if it were a supernatural agency permitted by the Almighty, it would surely be for some definite end. These phenomena belong to neither class; my persuasion is, that they originate in some brain now far distant; that that brain had no distinct volition in anything that occurred; that what does occur reflects but its devious, motley, ever-shifting, half-formed thoughts; in short, that it has been but the dreams of such a brain put into action and invested with a semi-substance. That this brain is of immense power, that it can set matter into movement, that it is malignant and destructive, I believe; some material force must have killed my dog; the same force might, for aught I know, have sufficed to kill myself, had I been as subjugated by terror as that dog—had my intellect or my spirit given me no countervailing resistance in my will."

"It killed your dog! that is fearful! indeed it is strange that no animal can be induced to stay in that house; not even a cat. Rats and mice are never found in it."

"The instincts of the brute creation detect influences deadly to their existence. Man's reason has a sense less subtle, because it has a resisting power more supreme. But enough; do you comprehend my theory?"

"Yes, though imperfectly—and I accept any crotchet (pardon the word), however odd, rather than embrace at once the notion of ghosts and hobgoblins we imbibed in our nurseries. Still, to my unfortunate house the evil is the same. What on earth can I do with the house?"

"I will tell you what I would do. I am convinced from my own internal feelings that the small unfurnished room at right angles to the door of the bedroom which I occupied, forms a starting-point or receptacle for the influences which haunt the house; and I strongly advise you to have the walls opened, the floor removed—nay, the whole room pulled down. I observe that it is detached from the body of the house, built over the small back yard, and could be removed without injury to the rest of the building."

"And you think, if I did that——"

"You would cut off the telegraph wires. Try it. I am so persuaded that I am right, that I will pay half the expense if you will allow me to direct the operations."

"Nay, I am well able to afford the cost; for the rest, allow me to write to you."

About ten days afterward I received a letter from Mr. J——, telling me that he had visited the house since I had seen him; that he had found the two letters I had described replaced in the drawer from which I had taken them; that he had read them with misgivings like my own; that he had instituted a cautious inquiry about the woman to whom I rightly conjectured they had been written. It seemed that thirty-six years ago (a year before the date of the letters) she had married, against the wish of her relations, an American of very suspicious character; in fact, he was generally believed to have been a pirate. She herself was the daughter of very respectable tradespeople, and had served in the capacity of a nursery governess before her marriage. She had a brother, a widower, who was considered wealthy, and who had one child of about six years old. A month after the marriage, the body of this brother was found in the Thames, near London Bridge; there seemed some marks of violence about his throat, but they were not deemed sufficient to warrant the inquest in any other verdict than that of "found drowned."

The American and his wife took charge of the little boy, the deceased brother having by his will left his sister guardian of his only child—and in event of the child's death, the sister inherited. The child died about six months afterward—it was supposed to have been neglected and ill-treated. The neighbors deposed to have heard it shriek at night. The surgeon who had examined it after death said that it was emaciated as if from the want of nourishment, and the body was covered with livid bruises. It seemed that one winter night the child had sought to escape—crept out into the back yard—tried to scale the wall—fallen back exhausted, and been found at morning on the stones in a dying state. But though there was some evidence of cruelty, there was none of murder; and the aunt and her husband had sought to palliate cruelty by alleging the exceeding stubbornness and perversity of the child, who was declared to be half-witted. Be that as it may, at the orphan's death the aunt inherited her brother's fortune. Before the first wedded year was out, the American had quitted England abruptly, and never returned to it. He obtained a cruising vessel, which was lost in the Atlantic two years afterward. The widow was left in affluence; but reverses of various kinds had befallen her; a bank broke—an investment failed—she went into a small business and became insolvent—then she entered into service, sinking lower and lower, from housekeeper down to maid-of-all-work—never long retaining a place, though nothing decided against her character was ever alleged. She was considered sober, honest and peculiarly quiet in her ways; still nothing prospered with her. And so she had dropped into the workhouse, from which Mr. J——had taken her, to be placed in charge of the very house which she had rented as mistress in the first year of her wedded life.

"ON THE STONES IN A DYING STATE."

Mr. J—— added that he had passed an hour alone in the unfurnished room which I had urged him to destroy, and that his impressions of dread while there were so great, though he had neither heard nor seen anything, that he was eager to have the walls bared and the floors removed as I had suggested. He had engaged persons for the work, and would commence any day I would name.

The day was accordingly fixed. I repaired to the haunted house—we went into the blind, dreary room, took up the skirting, and then the floors. Under the rafters, covered with rubbish, was found a trap-door, quite large enough to admit a man. It was closely nailed down, with clamps and rivets of iron. On removing these we descended into a room below, the existence of which had never been suspected. In this room there had been a window and a flue, but they had been bricked over, evidently for many years. By the help of candles we examined this place; it still retained some mouldering furniture—three chairs, an oak settle, a table—all of the fashion of about eighty years ago. There was a chest of drawers against the wall, in which we found, half-rotted away, old-fashioned articles of a man's dress, such as might have been worn eighty or a hundred years ago by a gentleman of some rank—costly steel buckles and buttons, like those yet worn in court dresses—a handsome court-sword—in a waist-coat which had once been rich with gold-lace, but which was now blackened and foul with damp, we found five guineas, a few silver coins, and an ivory ticket, probably for some place of entertainment long since passed away. But our main discovery was in a kind of iron safe fixed to the wall, the lock of which it cost us much trouble to get picked.

"BY THE HELP OF CANDLES WE EXAMINED THIS PLACE."

In this safe were three shelves, and two small drawers. Ranged on the shelves were several small bottles of crystal hermetically stopped. They contained colorless volatile essences, of the nature of which I shall only say that they were not poisons—phosphor and ammonia entered into some of them. There were also some very curious glass tubes, and a small pointed rod of iron, with a large lump of rock-crystal, and another of amber—also a loadstone of great power.

In one of the drawers we found a miniature portrait set in gold, and retaining the freshness of its colors most remarkably, considering the length of time it had probably been there. The portrait was that of a man who might be advanced in middle life, perhaps forty-seven or forty-eight.

It was a remarkable face—a most impressive face. If you could fancy some mighty serpent transformed into man, preserving in the human lineaments the old serpent type, you would have a better idea of that countenance than long descriptions can convey; the width and flatness of frontal—the tapering elegance of contour disguising the strength of the deadly jaw—the long, large, terrible eye glittering and green as the emerald—and withal a certain ruthless calm, as if from the consciousness of an immense power.

Mechanically I turned round the miniature to examine the back of it, and on the back was engraved a pentacle; in the middle of the pentacle a ladder, and the third step of the ladder was formed by the date of 1765. Examining still more minutely, I detected a spring; this, on being pressed, opened the back of the miniature as a lid. Within-side the lid was engraved, "Mariana, to thee—Be faithful in life and in death to ——." Here follows a name that I will not mention, but it was not unfamiliar to me. I had heard it spoken of by old men in my childhood as the name borne by a dazzling charlatan who had made a great sensation in London for a year or so, and had fled the country on the charge of a double murder within his own house—that of his mistress and his rival. I said nothing of this to Mr. J——, to whom, reluctantly, I resigned the miniature.

We had found no difficulty in opening the first drawer within the iron safe; we found great difficulty in opening the second; it was not locked, but it resisted all efforts, till we inserted in the chinks the edge of a chisel. When we had thus drawn it forth, we found a very singular apparatus in the nicest order. Upon a small, thin book, or rather tablet, was placed a saucer of crystal; this saucer was filled with a clear liquid—on that liquid floated a kind of compass, with a needle shifting rapidly round; but instead of the usual points of a compass were seven strange characters, not very unlike those used by astrologers to denote the planets. A pecular, but not strong nor displeasing odor, came from this drawer, which was lined with a wood that we afterward discovered to be hazel. Whatever the cause of this odor, it produced a material effect on the nerves. We all felt it, even the two workmen who were in the room—a creeping, tingling sensation from the tip of the fingers to the roots of the hair. Impatient to examine the tablet, I removed the saucer. As I did so the needle of the compass went round and round with exceeding swiftness, and I felt a shock that ran through my whole frame, so that I dropped the saucer on the floor. The liquid was spilt—the saucer was broken—the compass rolled to the other end of the room—and at that instant the walls shook to and fro, as if a giant had swayed and rocked them.

The two workmen were so frightened that they ran up the ladder by which we had descended from the trap-door; but seeing that nothing more happened they were easily induced to return.

"I FELT A SHOCK THAT RAN THROUGH MY WHOLE FRAME."

Meanwhile I had opened the tablet; it was bound in plain red leather, with a silver clasp; it contained but one sheet of thick vellum, and on that sheet were inscribed, within a double pentacle, words in old monkish Latin, which are literally to be translated thus: "On all that it can reach within these walls—sentient or inanimate, living or dead—as moves the needle, so work my will! Accursed be the house, and restless be the dwellers therein."

We found no more. Mr. J—— burned the tablet and its anathema. He razed to the foundations the part of the building containing the secret room with the chamber over it. He had then the courage to inhabit the house himself for a month, and a quiter, better conditioned house could not be found in all London. Subsequently he let it to advantage, and his tenant has made no complaints.

THE END.

THE PRACTICAL VALUE OF A PICTURE.

In the pursuit of our work for the improvement of the common roads of America, the force of pictorial illustration has been shown with wonderful effect. The eye is a supreme educator. It tells a story briefly and correctly, and is the one means of communication by which external facts are impressed upon the human brain in such a way as to induce among all classes uniform effect and uniform conviction. More briefly stated, these illustration have more than justified the old and familiar saying that "seeing is believing." We shall go on with the use of these pictures, supplying such descriptive text as may properly accompany them, and shall hope confidently for a further spread of the agitation which they have helped so strongly to bring about.

And you, indulgent reader, may render great service in the prosecution of this plan, besides giving to the movement a special impetus in your locality, by sending to this magazine photographs showing the miserable condition of the roads in your neighborhood, or (if fortune has thus favored you) the excellent improvements and good results which have been obtained by the friends of better roads in the vicinity of your home. These pictures, and such facts and figures as may be pertinent to give them force, will be always welcome, and will, in most cases, be produced in one form or another in the pages of Good Roads. To stimulate you in this work we have offered valuable cash prizes (see our advertising pages) for the best collection of photographs on this subject.

THE EDITORS TABLE

COL. JOHN A. PRICE.

Last month, when we presented as a leading article in this magazine that well written argument "Commerce Demands Better Roads," by Col. John A. Price, Vice-President of the National Board of Trade, we little anticipated the sad news of Col. Price's death which came to us almost before the ink was dry upon the manuscript which he had placed in our hands. Few Americans have served their country more unselfishly or with better ability than did Col. John A. Price. His personal history is a history of work done for the public weal, and his hand was always directed to the accomplishment of some needed reform. His worth and abilities were recognized in the councils of his state and his country, and for many years he has served in official positions with conspicuous ability. The announcement of his death, which occurred at his home at Scranton, Pa., was received with deepest regret by numberless friends in all parts of the country.

It is difficult to imagine by what theory or excuse the commissioners of the Columbian Exposition can ignore the demand of the American people for a comprehensive road exhibit, and for the bringing together, in convenient and systematic form, of all those scattered things relating to the art and practice of road building which the Exposition will present to the eye of the strolling visitor. There is always more or less of a tendency towards self-glorification when the people of a country inaugurate a great fair, but the supreme and lasting, and indeed the only worthy object of such an exhibit is to instruct; and since there is no subject in which the people are so widely interested, and none upon the practical details of which so much ignorance prevails, the instructive side of the road improvement question should have the attention of the commissioners to a degree in some way commensurate with its importance. The Act of Congress which provided for the Columbian Exposition recites "that it is fit that there should be an exhibit of the progress of civilization in the New World." Good roads and civilization go hand in hand, and since, in a few favored sections of our country, good roads have been built and used and therefore appreciated, it is fit and proper that the ways and means for their construction should be shown by a special exhibit. The need of such an exhibit, and the wide demand for it which has found place in the letters of eminent men in all our states and in the leading newspapers of the country, have been fully shown by the admirable work of Col. Albert A. Pope in his recent memorial to Congress and in the various letters and papers which Col. Pope has made public on this subject. Indeed, if the end to which Col. Pope's efforts have been so strongly directed shall ever be attained, it will be mainly by reason of the strong and persistent manner with which he has made known its importance.

To say that space is lacking or that sufficient appropriation cannot be directed for the proper making of this exhibit is to pronounce an idle and ill-founded excuse. Directly southward from and adjoining the Exposition grounds in Jackson Park, lies a spacious and ample piece of open territory, than which none better could be selected for the practical exhibit of road machines and the various methods of construction adopted in the several countries where good roads are in common use. The erection of a temporary structure at this point could be accomplished at moderate cost and maintained during the great exposition, and thus a department established would prove an attractive and certainly a most useful feature. But it is idle to prolong the argument in favor of this exhibit. It is sufficient to say that it is the one feature of the Exposition that stands alone in its supreme usefulness, in its promise of profitable results and in the unanimity with which it has been urged upon the commissioners by the intelligent people of the country.

ELECTION day is coming. Don't vote for the man who is not statesman enough to declare himself in favor of the improvement of the roads.

MICHIGAN is said to be considering the practicability of working her convicts for the improvement of her roadways. Such an experiment would be viewed with a lively interest in other states, both in its industrial bearings and in its relation to the cause of good highways, a cause which, thanks to the bicycle, is beginning to attract public attention everywhere.

THERE is a woman out in Valparaiso, Ind., who rejoices in the euphonious cognomen of Mrs. Henrietta Guterpelt, and whose feminine keenness a few weeks ago, led her to the root and marrow of the bad road nuisance when she caused the arrest of Charles Benke, Trustee of Liberty Township, and Frederick Lerenz, road supervisor, for failing to keep the highways in condition for public traffic. We believe this is the first recorded case in which an American citizen has caused the arrest of delinquent officials who are charged with the repair of public roads. Mrs. Guterpelt is deserving of all praise. She is a pioneer in an unexplored field of litigation, and the prayers of the people are with her. It is in no way likely that either Mr. Benke or Mr. Lerenz were better informed than is the average country road official regarding their lawful duties in the care of the public roads, and it may be fairly assumed that, having never read the road laws of their state, they have been living out their official terms in guileless ignorance that anything special was required of them beyond an occasional mauling of the dirt in dry weather. It is believed that the heroic measures adopted by Mrs. Guterpelt in leading these gentlemen into a court of justice, will at least induce the people of the Valparaiso district to look into the moth-eaten road laws of Indiana, and inform themselves just how deep above the top of his head these road officers may allow a man to sink in the Indiana mud before they are legally bound to lend a hand for his salvation.

CERTAIN ambitious, and in some respects misguided farmers of the State of New York have banded themselves together in numbers of more or less significance for the worthy purpose of correcting some of the public evils which for years have laid their heaviest burdens upon the rural population. In the interest of this association there is published in the old Dutch town of Albany a paper called *The Farmer's Union League Advocate*, a copy of which, by the kindness of a near friend, has been placed in our hands. The editor of the *Advocate* seems to have very pronounced ideas on nearly every subject under the sun, and if we may judge by the editorials in this sample copy, the *Advocate* advocates everything that obstructs improvement and opposes everything that advocates it. Not to appear as far behind the times as he really is, the editor of the *Advocate* undertakes a leader on the subject "Roads Good and Bad," and having chosen a popular and promising title, he goes on to express a wholesome satisfaction with the condition of the country roads of the State of New York, and mildly scores this magazine for suggesting anything to the contrary. A brief quotation will illustrate: "It is amusing to one familiar with the road system of the state to examine the illustrations published in GOOD ROADS. It may readily be seen that these pictures are obtained from the most remote districts, and at a time when the condition of the weather is such as to place them at their very worst. Will GOOD ROADS kindly publish a few pictures showing some of the good features of the present road system?"

Differing as we do from our Albany friend, we are still most anxious to grant his editorial request. Accordingly we shall undertake within the near future to publish a few pictures taken within a moderate radius from the office of the *Advocate*, and if the scenes shall be near enough to the headquarters of that journal to invite editorial recognition, we shall hope to be forever afterwards acquitted of the unjust charge of publishing pictures "obtained from the most remote districts." And, incidentally, we shall print with these pictures a few statements of fact and figures from which *The Farmer's Union League Advocate* may get a few healthful ideas that seem not to have been taught in the Albany kindergarten.

NEWS AND COMMENT

THE Iowa Roads Improvement Association recently formed at the Des Moines Convention has begun its work with an impetus which gives great promise of success. The following are the permanent officers recently elected: President, Hon. E. H. Thayer, editor of the Clinton *Age*; Secretary, Major O. L. F. Brown, of Des Moines; Treasurer, Captain C. B. Worthington, of Des Moines. The executive board will select a vice-president for each county in the state and it will be the special duty of this board to organize county associations and press the work vigorously in their separate localities. A letter recently received from Secretary Brown says: "This movement seems to stir all classes and conditions and much is hoped from it."

WE are indebted to Chief Consul Choate for the following interesting item of news showing the misery caused by the want of good roads in that state. The statement came to him from Rev. J. F. Brennan, a Catholic priest of Webster City, Hamilton County, Iowa. We quote: "Pokahontas Centre is the county seat of Pokahontas County. Its nearest railroad station is about fifteen miles distant. During the raw cold weather last Spring the inhabitants of Pokahontas Centre suffered severely with cold and hunger on account of a fuel famine. It is a prarie county and they rely on coal for fuel. The Winter supply was exhausted, the roads were impassable and no coal could be hauled from the railway. The village sidewalks and lumber piles were burned and everything else that would burn, even corn and hay. Finally, at an expense of $30, with several span of horses, a few hundred pounds of coal were hauled from the railway to relieve the sufferers. Witnesses and jury could not reach town and court was adjourned on account of mud."

THE Highway Commission appointed by the Governor of Michigan "to investigate, consider and report to the next session of the Legislature, a plan of legislation looking to the improvement of the highways of the state, and also to report as to the practicability of using convict labor in connection with such an improvement," has begun active work looking to the preparation of its official report. The commission is made up of Wm. L. Webber, of Saginaw; Reuben Goodrich, of Traverse City, and James H. Kinnane, of Kalamazoo. Chairman Webber has sent out a large number of requests in circular form asking for printed copies of laws, bills, reports and other documents which may aid the members of the committee in preparing their report. The circular closes as follows: "This subject has received very much attention in the different States of the Union, and this Commission hopes to be greatly aided in its labors by the conclusions reached by those who have given the subject mature consideration."

IT is one thing to own a stone crusher and another thing to know how to use it. The authorities in Allegany County, Md., have lately employed themselves to some extent in crushing limestone for the repair of the old national road which runs through that county, but if one may judge by the density of ignorance displayed in this "repair work," a primary school for road makers would be a godsend to some of the people of that county. We have a letter from a prominent engineer who writes from Frostburg on July 18, enclosing sketches showing the size of some of the stones which have been dumped loosely on the road. Four of these stones measure 90, 24, 130 and 24 cubic inches respectively, and any one of them is large enough to make possible a broken neck to any man or beast that travels the road on a dark night. Our informant's letter concludes: "Of course to keep such stones on the road until they can move the crusher to another locality, the authorities have had recourse to the time-honored 'cuss'-tom of covering good clean limestone with ashes and dirt; and yet we have very few good roads in Allegany County."

CONTRACT NOTES

ROADS AND STREETS.

ARIZONA.—County Surveyor Chillson has just completed survey for a new country road between Tuscon and Nogales, which when completed will shorten the travelling distance from seventy-nine to sixty-four miles. The estimated cost of the new road is $3,000, besides the regular road work through the three road districts through which it passes—Tuscon, Arivaca and Nogales.

OHIO.—AKRON.—Spruce Street will be improved by grading, guttering, curbing, sewering and paving the roadway with brick. Bids will be received by the City Engineer, S. W. Parshall, until September 3.

CINCINNATI.—Bids for paving one street with granite block will be received at this city by the Board of Administration, until September 1. Also one street with asphalt, for which bids will be received until September 6.

The Board of Administration will received proposals for the improvement of Conroy Street until September 9.

CLEVELAND.—Paving is to be done in six streets with dressed block medina sandstone, in four with brick, and two with asphalt. Bids will be asked for at an early date.

HAMILTON.—Until September 6, proposals will be received by the City Clerk, J. J. McMaken, for paving and improving C Street, according to the specifications and plans of the City Engineer.

Bids will be received by the City Clerk until September 6 for four contracts.

DAYTON.—Bids are advertised for by the City Comptroller for paving alleys.

5,426 square yards of Monument Avenue are to be improved, and 7,400 square yards of Ludlow Street are to be paved with Hayden block, Hallwood block, asphalt or brick. Bids for the work will be received until September 16 by the City Comptroller.

YOUNGSTOWN.—The issue of bonds for $25,000 to pave Madison Avenue with asphalt has been authorized by the City Council.

LIMA.—Three streets are to be improved, by order of the Council.

GREENVILLE.—Thirteenth Street is to be improved. Bids are asked by the City.

FREMONT.—Two streets are to be paved with fire brick, for which bids will be received by the Committee on Improvements until September 12.

TOLEDO.—Western Avenue from Wayne to the Canal is to be paved, under an ordinance passed by the Council of said city.

Bids will be received until September 14, by the Board of County Commissioners, for macadamizing Stickney Avenue outside the city limits.

PIQUA.—It is desired as soon as possible to have Madison Avenue, from Park Avenue to Cherry Street, and Weber Street, from Young to South Streets, graded and graveled.

YOUNGSTOWN.—The residents of this city are eagerly looking forward to having Madison Avenue paved with asphalt in the near future.

MASSILON.—City Clerk E. B. Bayliss will receive sealed proposals for paving East Main Street with brick.

TIFFIN.—Improvements are to be commenced shortly on Market Street, by curbing and paving. Jeremiah Rex, the City Clerk, will receive proposals.

ILLINOIS.—MATOON.—Three blocks on West First and Western Avenue are to be curbed, paved and graded. Sealed bids to be received by the City Clerk, who will furnish any further information.

Three blocks are to be paved, graded and curbed and bids will be received by the City Clerk until September 12.

MONMOUTH.—Work consisting of the paving of several streets will be readvertised, as the Council has found it necessary to reject the ones they received.

STERLING.—Sealed proposals will be received until September 5, by the City Clerk, for furnishing materials and doing the work of paving Third Street, from Third Avenue to B Avenue. The work is as follows: Brick paving 12,812 square yards; curbing 4,400 lineal feet; 750 cubic yards stone retaining walls. The whole of the work is to be completed by November 1, 1892. Plans and specifications and further information can be obtained from the City Clerk.

12,812 square yards are to be brick paved, 4,400 lineal feet curbed, for which bids will be asked until September 5 by the City Clerk.

NEW YORK.—TONAWANDA.—Paving is to be done on three streets of this city by order of the Council, which has voted to issue bonds for $144,595.

NEW YORK.—Bids will be received by the Commissioner of Public Works until September 6 for thirty-three contracts, thirty of which are for paving with granite blocks.

TROY.—Hutton, Washington, Adams, First and Rensslaer Streets are to be paved in due course of time. Bids will probably be let at an early date.

BROOKLYN.—Several of the prominent property owners of this city residing on North Third Street, from Kent Avenue to Bedford, have petitioned the Mayor to use his influence in having said street paved with Belgian block.

CORNING.—Bids are asked for paving Pine Street from First to Erie Avenue.

FLUSHING.—Bids are asked by the Board of Trustees of this village for macadamizing about seven and one-quarter miles of street. Each bid must be accompanied by a certified check for $2,000. Plans and specifications and any further information may be obtained from G. A. Roullier, C. E, 20 Main Street, Flushing, N. Y.

INDIANA.—Terra Haute.—About 9,118 feet of Seventh Street are to be paved in the near future with asphalt, plans and specifications for which have been prepared.

WASHINGTON.—Mt. Vernon.—The proposition has been discussed by the County Board of Trade to build a system of roads in the county of Skagit, aggregating 140 miles.

CALIFORNIA.—San Francisco.—A resolution has been passed by the Board of Supervisors of the said city, providing granite curbs to be laid on Sacramento Street, between Powell and Stockton Streets, if not already laid; that the granite curbs now laid if not in official line and grade, be reconstructed to such; that the roadway be paved with cobble stones, except that portion of it which is required to be kept in repair by the railroad companies having tracks thereon, and also that granite crosswalks be put down across the southerly and northerly portion of the crossing of Prospect Place and Sacramento Street, and across the intersected parts of Miles and Sacramento Street.

The Board of Supervisors passed a resolution providing that De Haro Street, between Colusa and Marin Streets, be graded to the official grade and line. Further information may be obtained from the Superintendent of Public Streets, Highways and Squares.

MISSOURI.—Kansas City.—It has been advised by the Board of Public Works that 4,393 lineal feet of Prospect Street be paved with asphalt.

MASSACHUSETTS. — Pittsfield. — Improvements in the shape of curbing, guttering and constructing asphalt sidewalk has been approved of by the Highway Committee, the cost of which is estimated at about $10,000.

RHODE ISLAND. — Providence. — Charles Street will be paved with granite blocks at an appraised cost of $13,000. Certain streets in the same city are to be macadamized.

PENNSYLVANIA.—York.—It is under consideration to have some street paving, macadamizing and grading done in this city, and perhaps a system of sewerage. So says J. G. Durpin, City Engineer.

Alleghany.—About 250,000 asphalt blocks will be required for the proposed work in Western Avenue of this city.

KENTUCKY.—Louisville.—Twenty streets are to be paved with brick by the order of the City Council.

DISTRICT of COLUMBIA. — WASHINGTON. — Sealed proposals will be received at the office of the Commissioners for furnishing granite paving block. Specifications, blank forms of proposals and any further information may be obtained at their office, they reserving the right to reject any and all bids or portions of bids. J. W. Douglas, J. W. Ross, W. T. Rossell, Commissioners.

TEXAS.—Palestine.—It is proposed to pave two of the principal streets. Bids will probably be let during this season.

CONNECTICUT.—Norwalk.—Bids will shortly be asked for paving Main Street. The work includes macadamizing 11,410 cubic yards at 85 cents and 1,970 square yards granite paving at $2.75.

TENNESSEE.—Chattanooga.—Several streets are to be paved, for which work bids will be asked.

NEBRASKA.—Freemont.—Bids will be asked by the Board of Public Works for paving to be commenced in three districts.

NEW JERSEY.—New Brunswick.—At a meeting of the Road Commissioners of the Board of Freeholders it was decided to draw up the necessary specifications for bids for the building of a road from Plainfield to Metuchen, which is to be twelve feet wide and covered with eight inches of stone.

SEWERS.

ARIZONA.—Phoenix.—The new sewer at this place is progressing nicely, and will doubtless be in operation within sixty days. There is one main, 14,000 lineal feet in length, of 16-inch salt-glazed vitrified clay pipe, and 20,000 feet of laterals will be constructed.

OREGON.—Portland.—Six miles of street work will be advertised in a short time by the city officers.

NEW HAMPSHIRE.—Concord.—$17,000 has been appropriated in West Concord for the building of a sewer. Work will be begun at an early date.

Bids are asked for laying twelve miles of sewer pipe from six inches to twenty-four inches in diameter and constructing the necessary manholes and other appurtenances required for the sewerage system of the city of Rochester. Plans and specifications are on file at the office of the City Clerk.

SOUTH DAKOTA.—Sioux Falls.—Bids will be advertised for by the Council for the making of a sewerage system, the work for which will be let on contract.

CALIFORNIA.—Los Angeles.—Bids are asked for the construction of sewers in the following districts: One along Ionia Street from a point 150 feet east of east line of Edgware Road to Figueroa Street, to Ionia Street, to manhole at intersection of Figueroa and Temple Streets; also one from the city to the Pacific Ocean, cost not to exceed $395,000.

Oakland.—An eight-inch pipe sewer, with "Y" branches and manholes, will be put in on Eighth Street.

San Francisco.—Chattanooga Street, from Twenty-fourth to Jersey Streets, is to have a fourteen-inch iron-stone pipe sewer with manhole and cover. Another sewer is to be constructed at intersection of Chenery and Randall Streets with manhole and cover.

MASSACHUSETTS.—Boston.—The Board of Metropolitan Sewerage Commissioners will furnish forms of contract and specifications for the building of a syphon across and under Shirley Gut, Boston Harbor, for which sealed bids will be received at the office of the above named Commissioners until 12 o'clock on Saturday, September 10, 1892. All bids must be entered on the blank forms furnished by the Board, and no bid will be accepted unless accompanied by a certified check for the sum of $1,000. The diameter of the pipes are to be sixty inches; length of each line, 220 feet; time to complete, until July 31, 1893. Plans and specifications, etc., will be furnished by the said Board.

MALDEN.—Bids will probably be asked very soon for a system of sewers in this place.

MAINE.—CALAIS.—It is intended, in the course of time, to have a system of sewerage here, and plans have been prepared by McClintock & Woodfall, of Boston.

RHODE ISLAND.—EAST GREENWICH.—Plans and estimates for a sewerage system are expected to be prepared as soon as an engineer is employed to do so.

OHIO.—AKRON.—For furnishing the city with sewer pipe during the ensuing year, bids are asked until September 3.

SANDUSKY.—Proposals are asked for a sewer in Jefferson Street, by the City Clerk, until September 3.

BUCYRUS.—Bids will be received until September 6 by the City Clerk for the West Charles Street sewer.

OBERLIN.—Until September 8, bids will be received for three pipe sewers, namely, 1,400 feet of 10-inch; 10,500 feet of 18-inch; 700 feet of 10-inch. W. B. Gerrish, Village Engineer.

Sealed proposals will be received until September 8, by the Clerk of said village, for laying 1,400 feet 8-inch sewer pipe; 700 feet 10-inch sewer pipe; 10,500 feet 18-inch sewer pipe. Plans and specifications may be seen at the office of the Engineer.

INDIANA.—ELKHART.—The City Clerk is receiving bids for a sewer in East Street.

ELWOOD.—Work will soon be advertised as follows: 1,200 feet of 40-inch and 2,500 feet of 36-inch brick, and 4,000 feet of pipe sewer. Plans are now being prepared by the City Engineer, H. S. Freeman.

Until September 12, bids will be received for single ring brick sewers as follows: 30-inch, 10-foot cut, 984 feet; 36-inch, 12-foot cut, 1,250 feet; 24-inch, 9-foot cut, 1,550 feet; and 40-inch, 15-foot cut, 2,380 feet; 18 catch basins. City Engineer, H. S. Freeman.

ILLINOIS.—CHICAGO.—A large number of improvements are to be made. In Ward Thirty ten streets are to have sewers by order of the Council.

MORGAN PARK.—Bids are asked for furnishing the materials and constructing the following sewers in the village: In Western Avenue, from 115th Street to Morgan Avenue; in Western Avenue, from Morgan Avenue to 107th Street; in Western Avenue, from 107th Street to Tracy Avenue; in Western Avenue, from 101st Street to Tracy Avenue; in Western Avenue, from 99th Street to 101st Street; in 107th Street, from Western Avenue to Grand Avenue; north of 107th Street, along Grand Avenue and an extension thereof, and 101st Street, as extended; that part of the main outlet sewer for the main Morgan Park drainage district lying in Ashland Avenue, between Raymond Street and 119th Street; that part of main outlet sewer lying in Ashland Avenue, between 119th Street and a point 3,400 feet south thereof; that part of main outlet sewer lying in Ashland Avenue, between said point 3,400 feet south of 119th Street and Blue Island Road; in Tremont Street, from 119th Street to 111th Street. These sewers are to be built of brick and vitrified tile pipe, and vary in diameter from six to fifteen inches. Plans and specifications are on file with the Village Clerk, Edgar Ayres.

MONMOUTH.—It is under consideration of the City Council to lay a main sewer estimated to cost about $34,000.

BELLEVILLE.—Mr. Wickenden, of Toledo, has completed plans for a sewerage system, for which bids will probably be asked.

MARYLAND.—DENTON.—Bids are asked by the County Commissioners for building a new bridge in the Third Election District of the county over the stream known as "Watts Creek," on the road leading from Denton to "Hobbs Corner," and at the foot of the hill near the "Slaughter Farm." Information can be had on application to George A. Deakyne.

CONNECTICUT.—WILLIMANTIC.—Bids are asked for the construction of sewer and appurtenances in Maine, Turner, Prospect and Summit Streets. Information can be had on application to George W. Melony.

WATERBURY.—Bids are asked for the construction of a sewer and appurtenances in Emerald Street, from Fuller to Pleasant; Ayres Street, from Emerald to the summit, and James Street, from the present termination of the sewer to the end of the street. Plans, specifications, etc., can be seen at the office of the City Engineer, R. A. Cairns.

WISCONSIN.—MILWAUKEE.—At Whitefish Bay it is proposed to put in a complete sewerage system. Bids will probably be asked for shortly.

MINNESOTA.—MINNEAPOLIS.—The City Engineer has been directed by the Board of Aldermen to prepare estimates for thirty-two sewers.

NEW JERSEY.—FREEHOLD.—At the office of the Commissioners of this town, bids will be received until the 8th day of September, for the construction of new sewers. Specifications, forms of proposals and any further information may be obtained from the Commissioners. All bids must be accompanied by a deposit of $1,000 as a guarantee of the good faith of the bidder.

JERSEY CITY.—Sealed proposals will be received by the Board of Street and Water Commissioners on Monday, September 12 at 10 o'clock, A. M., for the work and materials necessary for the following work: A 30-inch oval brick sewer in Ocean Avenue, from Cator Avenue to Warner Street; a 24-inch oval brick sewer in Ocean Avenue, from Warner Avenue to Cedar Avenue; a 12-inch pipe sewer in Ocean Avenue, from Stevens Avenue to a point to about 100 feet easterly from Sheffield Street. Plans and specifications are on file at the office of the Chief Engineer, corner of Jersey Avenue and Mercer Street. The estimated quantities are as follows: 1,190 feet of brick sewer; 900 feet of 24-inch brick sewer; 1,350 feet of 12-inch pipe sewer; 9 receiving basins, new; 3 receiving basins, reset; 25 cubic yards of concrete; 300 cubic yards of rock excavation; 20,000 feet B. M. of sheathing. Particulars may be had by addressing George K. P. Bouten, Clerk.

WEST VIRGINIA.—BRIDGEPORT.—It is proposed to hold a meeting to vote for the issuance of bonds for $12,000 for a sewerage system.

GEORGIA.—ATLANTA.—A sewer is to be constructed from the summit of the hill near Fair Street along and in Walker Street to Peter Street.

At a meeting of the Town Council of the said city, it was agreed to provide for the laying of a sewer from Peachtree Street along Ellis Street to Ivy Street. The size, material and general character of this sewer are to be as follows: Eight and twelve-inch vitrified pipe, with brick manholes, catch basins, etc., from Peachtree Street to Ivy. The estimated cost of said sewer is to be $534. For further particulars apply to A. P. Woodward, City Clerk.

COLUMBUS.—Williamson & Earle, Engineers, have prepared plans for a sewerage system, and estimate the cost of the proposed work at $137,903.

NEW YORK.—PLATTSBURGH.—Sealed proposals are asked for a sewerage system at this place. Plans, specifications and further information can be had at the office of the Assistant Quartermaster of said city.

AMSTERDAM.—Howard Putman, Chairman, and Miles Cooling, Secretary, of the joint committee, will receive proposals till September 22 for the following work: Trenching and back-filling about 2,070 feet on Division Street, from Yeomans Street to Henrietta Street, for sewers and water; also for trenching and back-filling for sewers on Henrietta Street, from Division Street to Main Street, and across the N. Y. C. & H. R. R. to the Mohawk River; also for the furnishing of all materials and constructing the sewers on the lines above mentioned according to plans and specifications in the office of the City Clerk. A penal bond in the sum of $300 must be supplied by each bidder.

COBLESKILL.—The Board of Sewer Commissioners will receive sealed proposals until September 6, for the material and necessary construction of a sewerage system in this village. Plans, specifications, etc., may be seen at the office of the Clerk of said Board.

LOCKPORT.—It has been decided by the Council to build a sewerage system at an estimated cost of about $140,000, for which bonds will be issued to pay for same.

ROCHESTER.—The plans for the proposed East Side trunk sewer are being prepared. W. E. Crane has been appointed engineer of the work on the West Side sewer and surveys will be made at once. It is expected that contract will be let by next February.

BUFFALO.—The following improvements will be done in this city: Putting in a twelve and fifteen-inch tile sewer in Hirschbeck Street; 515 feet of twelve inch tile sewer in Winona Street; twelve-inch tile sewer in Russel Street; ten-inch tile sewer in Person Street. Sealed proposals will be advertised for by the Board of Public Works.

OSWEGO. A large portion of this city is to have cement or fifteen-inch vitrified pipe sewer laid, as decided by the City Council.

FULTON —S. E. Babcock, Little Falls, has been engaged by the Village Trustees to prepare estimates and retrospects for a sewerage system.

TROY.—Sealed proposals are asked for the construction of a sewerage system as follows: A public sewer in King Street from Crooked Alley to Jacob Street. A certified check payable to the order of the City Chamberlain for five per cent. of the amount of each proposal must accompany each bid. Specifications can be seen at the office of the City Engineer

Sealed proposals will be received by the members of the Contracting Board of this city until September 6 for the following work Constructing sewers in Second Street, between Harrison and Polk Streets; brick sewer in Spring Avenue, from Maple Avenue westerly; pipe sewer in Ida Street, from Second Street easterly; pipe sewer in Brunswick Avenne; pipe sewer in Third and Jackson Streets; pipe sewer in Thirteenth Street, between Farm and Christie Streets.

PENNSYLVANIA. — NEWCASTLE. — Bids are asked at the office of the City Clerk for the construction of the Croton Avenue sewer. Plans and specifications can be seen at the above office, and bids are to be addressed to "Department of Sewers," and enclosed "Proposals for Sewer."

BETHLEHEM.—A sewerage system is under consideration here.

CHESTER.—Bonds for $60,000 are proposed to be issued for a system of sewers.

SEWICKLEY.—Bids are asked for constructing a vitrified pipe sewer in Beaver Street, from Perry Street to a point near Boundary Street. Plans and specifications can be seen at the office of F. A. Dunham, Engineer.

WILKINSBURG.—Bids are asked for the construction of a sewerage system for the borough.

BRIDGES.

PENNSYLVANIA.—GETTYSBURG.—A low truss wooden bridge is to be erected across Spring Run, where the public highway leading from the York and Gettysburg Turnpike to Menges Mill crosses said stream, in Berwick Borough. The span is to be about twenty-six feet, sealed proposals for which will be received at the office of the County Commissioners of above town. Charles H. Ruff, Clerk.

OHIO.—HAMILTON.—It is proposed to build a bridge on Lane Street over Crawford's Run. Work will be begun at an early day.

COLUMBUS.—The proposed new street bridge is to span the Scioto at the city prison, and plans have been submitted by Chief Engineer Dunn. Mr. Dunn's estimate is $49,355, about $650 less than the appropriation of the Legislature.

NEW YORK.—ROCHESTER.—It is proposed to recommend the construction of a stone bridge at Andrews Street in this city the cost to be in the neighborhood of $75,000.

NEWTOWN CREEK.—The Board of Supervisors of Kings County calls for proposals for constructing new iron bridge, seat piers, and retaining wall at Meeker Avenue over Newtown Creek, Brooklyn. Printed copies of plans and specifications have been prepared by Civil Engineer John J. McLaughlin, and printed copies may be obtained of the Clerk of the Board of Supervisors of Kings County, at Room 13, County Court House, Brooklyn.

WEST VIRGINIA.—KEYSER.—The County Clerk of Mineral County will receive proposals until September 24 for the erection of two stone abutments for an iron bridge over Patterson's Creek at Barkville. Plans and specifications can be seen at the Clerk's office of the County Court.

MICHIGAN.—LANSING.—$25,000 of bonds have been appropriated for constructing a bridge at Franklin Street.

BORROWED WIT

THE EDITOR AND THE SUMMER GIRL.

I hear the splash of ocean and the murmur of the hills,
The rolling of the rivers and the music of the rills;
I hear the wood-birds caroling their restless roundelays,
I feel the lazy languor of the coming Summer days.
I read delicious notices of mountains and of sea,
Where Summer time is such a time as Summer times should be;
I long with weary wistfulness to lay my labors down,
And for the God-made country give up the man-made town.
I hear a sweet seductive invitation from them all,
That beckons me, that welcomes me, that tempts me to my fall—
Yet I can dally at my desk and quite contented be,
If poets send no verses on the Summer Girl to me.

—*Will J. Lampton, in Life.*

"You make me tired," as the wheel said to the wagon-maker.

CONDUCTOR—What is the G. P. A. having so many popular excursions for?

Brakeman—Ter boom t' R. R.!—*Puck.*

A MODERN APPLICATION.

Teacher—Now, Johnny, tell us what you know about Crœsus.

Johnny—Please, Mum, dudes wear 'em in deir pants.—*Puck.*

"THEY say Green has been wandering in his mind late."

"Well, he's safe enough; he can't get far."—*Blacksmith and Wheelwright.*

"MR. NEWCOME," inquired the city editor, "did you write this article, in which the statement is made that 'K. K. Perkinson suicided yesterday afternoon?'"

"Yes, sir," answered the new man on the local staff.

"H'm!" rejoined the city editor, blandly; "Mr. Newcome you will please consider yourself 'resignationed.'"—*Chicago Tribune.*

FOREMAN—Galley 16 has just pied.

Editor—Rush her in and head it: "The Latest Proclamation of the Czar! How the Autocrat Dictates to His Suffering People!"—*Black and White.*

HE MEANT IT, TOO.

"Well, little boy, what's your name?"

"Shadrach Nebuchadnezzer Jones?"

"Who gave you that name?"

"I don't know. But yer bet cher life if I find out, when I gets me growth they'll be sorry for it."

BROKE UP THE MATCH.

Briggs—That was a sad thing about Springler, wasn't it? He was engaged to be married to a beautiful girl; the day was set, the cards issued, when suddenly she broke it off.

Griggs—What was the matter?

Briggs—He wrote a description of her wedding dress for a society paper, and she accidentally read it.—*Cloak Review.*

WIFE—John, you have a very annoying habit of saying "What's that?" whenever you are spoken to. Can't you break yourself of it?"

Husband (reading)—Eh, what's that?—*Blacksmith and Wheelwright.*

WHERE FALSEHOOD DIES.

Ah, when the sunny tresses grow
Out from the scalp and we behold
Two different colors, then we know
That all that's blondined is not gold.

—*Puck.*

DEACON VERIGOOD—I wonder what Brother Bluchips meant when he spoke to me to-day?

Mrs. Verigood—What did he say?

Deacon Verigood—I was so wrapped up in meditations on the sermon that I forgot to take up the collection, and he poked me and said: "Don't forget the kitty!"—*Puck.*

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VOL. 2. OCTOBER, 1892. NO. 4.

An illustrated monthly magazine devoted to the improvement of the public roads and streets

> "I am a strong believer in good roads, and, during my two terms in the Executive office, have contributed what influence could be exerted in that direction to the cause."
>
> *Ex-Governor Ladd of Rhode Island.*

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ISAAC B. POTTER
Managing Editor
PUBLICATION OFFICE
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GOOD ROADS.

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THE SPECULATOR AND THE COUNTRY ROADS.

By Albert C. Stevens, Editor of "Bradstreet's."

IN the greater portion of good road literature which has come under my notice within a year or two, emphasis seems to have been laid almost exclusively on the importance and economy of good highways to the farmer. The ordinary, every-day men of commerce and manufactures, together with those whose existence marks the age as one of refinement and culture, members of the four estates, not to forget the relatively small but rapidly growing class who live, without giving thought to the morrow, on what they or their ancestors have earned or obtained; all of these people, who number about two to one of the agriculturists in the United States, would seem to have even more of dominating interest in the existence and maintenance of good roads in the agricultural districts than have even the farmers themselves.

ALBERT C. STEVENS.

This view is somewhat socialistic, but it certainly seems as if we are here rather on the basis of what society should, can and will do, than as individuals. Besides, when one takes the trouble to look up the word socialism, there is not nearly so much dynamite in it as some of the writers of headlines for the daily newspapers would lead us to believe.

The only excuse for this divergent path is to make plainer, if possible, why two-thirds of society at large may be said to have something more than a mere "majority right" in demanding good roads, not only in the cities and towns, where most of the better class of highways now are, but throughout the agricultural districts as well.

It is beside the question to interject that it is equally to the farmer's interest to have good roads leading from his fields direct to country markets, and to highways reaching the larger cities, and that the farmer, once realizing this, will take the necessary steps to secure the end in view.

The point sought to be made is more vital than that; it is that even were such *not* the case, were good roads not in the interest of the farmer to the extent they undoubtedly are, it would still be capable of demonstration that society at large would be entirely justified in seeing that good roads are constructed throughout the agricultural districts.

There is the precedent in the building and maintenance by New York State of the Erie Canal, which, as every reader knows, extends from Lake Erie to the Hudson River, and was the original means of diverting the enormous traffic of the west and northwest almost exclusively to New York City, and has since been an important factor in enabling New York City to distance all competitors as the metropolitan seaport of the continent. The point to this precedent lies in the occasional objection of southern tier counties in New York State to being taxed for the maintenance of the Erie Canal, with the claim that as the canal does not touch the counties in question, they have little or no interest in it, and should not be compelled to pay for its maintenance.

You and I, Mr. Editor, and all of us know the fallacies which underlie such contentions; we know that the whole of New York State is benefited by the canal, through increased traffic and added wealth, so that the state tax is less than it would be without the augmentation of wealth due to the canal, and that in this the counties all participate.

For a like reason the two-thirds of us who are not agricultural toilers may properly demand of the farmer in the general interest of the body politic that he contribute his quota to bring into existence and maintain good roads in his own neighborhood, instead of spending years in trying to educate him to act of his own accord.

We are all aware that the farmer has been a "favorite son" among politicians of late—ever since the Alliance took shape, and that much that is senseless, demagogic, not to say unintelligent in a legislative way, has been suggested in order to coddle him, notably the sub-treasury scheme, free silver coinage, government loans to individuals at two per cent., and the "anti-options" bill—the latter a proposed abridgement of the right of contract. Not being a candidate for any public office within the gift of the people, one may reject hypocrisy and remark that, with the farmer if he will, but without him if he lags behind, we must have good country roads. Until this attitude is taken by the working friends of road improvement, little will be accomplished. Almost any intelligent farmer—and thousands of them have ideas not circumscribed by the boundaries of their farms—will admit in an unguarded moment the theoretical desirability of good roads; he will even admit the economy of the same, but he will not, as a rule, rise up and demand that his representative in the state legislature vote for a road improvement bill.

In May last there occurred one of the most striking illustrations of the necessity for rapidly enforcing the work of constructing good country roads throughout some of the great grain producing states which has taken place for years.

A number of gentlemen started a "deal" in May corn at Chicago. Owing to relatively small available stocks of corn at country storage points and at the larger domestic markets, and, *owing to the almost unprecedentedly impassable (muddy) condition of country wagon roads* in the great central, western and northwestern corn-growing states, they planned to "corner" corn. This meant that the firm or firms in question, with the aid of some banking capital, contemplated buying up available stocks of corn as well as all that the "bears" dared sell them "short," with the expectation that by the time deliveries on these contracts came due, the "bear" sellers would not be able to get the corn with which to make good the contracts; or, if they found corn enough to make good the deliveries, the price would be so high (the cornerers, or "bulls," owning practically all in sight) that those who had sold to the cornerers would lose large sums of money to the corresponding profit of the cunning "bulls."

An analysis of what all this meant is instructive.

This attempted corner was as inexcusable as any since the days of Joseph (whose "corner" in corn, we are informed, was strictly philanthropic in its object, and may therefore be left out of account), for the reason that the corn crop last year was an enormous one and pointed logically to cheap bacon, lard, ham, sausages, beef and other food products.

But the heavy floods of last Spring (due, by the way, to the lack of a thorough appreciation of the necessity for preserving and maintaining forests in the west and northwest) had to find an outlet, and so overflowed the country in all directions. Rain, too, fell with unremitting persistency, and the increasingly denuded forest lands not being able to take up and hold the quantity of water which they had formally retained, the surplus water spread itself over the country, so that besides the severe floods of the central and lower Mississippi, Missouri, Tennessee, Cumberland and Red River Valleys, the country roadways in that and adjoining regions were rendered lakes or lagoons or mud holes, for weeks at a time.

At this period there were in all probability more than 860,000,000 bushels of Indian corn in the hands of producers and others, back of stocks in leading market cities and towns, about one-third of the crop of 1891. The Chicago speculators knew this and knew that it could not be brought to market over the bad roads for weeks to come; all of which pointed to the probability of success for the attempted corner, due to the existence of bad roads. An important point also lies in the fact that the farmer, as a business man, could hardly have been expected to find fault with the Chicago crowd for having advanced the price of corn from 40 cents to about $1 per bushel, whether the higher price was artificial or not. This will impress itself the more forcibly when it is recalled that the agriculturist as well as another is generally ready to take the highest price he can get for his wares; and, if by reason of manipulation or otherwise, the price is put up to an unwarranted degree, he is generally not slow to take advantage of it.

In brief, after a superficial examination by the average farmer, he will generally be found regarding poor roads from time to time as an advantage; one which will enable him to sell for future delivery at higher prices, and offset the gain of cheap transportation over good roads.

Does this tend to influence him to hurry the day of good highways?

The inference that good roads result in the greatest ultimate advantage to the farmer is a fair one, but all farmers have not learned it and they are not bothering about it much.

Do you think it will be cheaper to propagandize indefinitely in the agricultural districts until the farming classes are ready to arise up as one man and aid in road improvements?

The Chicago May corner in corn appeared to make it worth $500,000,000 to holders of Indian corn alone not to improve their roadways. There was seemingly $500,000,000 premium placed on poor highways in one direction alone. Cattle, hogs, wheat, oats, and other staple products are from season to season similarly affected, owing to temporarily impassable roads.

As editor of *Bradstreet's*, the writer has received hundreds of telegrams weekly in the Spring and Autumn, for years past, in view of the tenor of which he does not hesitate to express the opinion that the agricultural community's natural interest to get the highest possible price for their products at all times, tends to render them periodically less ardent advocates of good roads than a complete and accurate analysis of their own positions should make them. It is to the class who are more distinctly consumers rather than producers of farm products that active vital aid for road improvement in the near future must be almost exclusively looked for.

CO-OPERATION OF STATE AND NATION.

By J. F. Jackson, Editor of "The Southern Planter."

THE article in the April issue of the *Century* magazine was a most valuable contribution to the instruction of the people on this vital question for the prosperity of the country. It failed, however, in my opinion, to grapple with the real difficulty which stands in the way of progress in the work, in that it dealt only with the mechanical or technical side of the question, whilst from a long and careful study of the subject, I am convinced that the real obstacle in the way of our obtaining good roads is a financial rather than a technical one. It is true that the principle upon which roads ought to be built is little understood even in the most thickly inhabited parts of the country, and in the sparsely populated country districts is absolutely unknown, and therefore an article explaining this was most timely and instructive; but from a long practical experience with roads in England where I, for a number of years, was a member of a highway board, having charge of a large mileage of heavily trafficked road, I am satisfied that this question of how to build and maintain a road is one easy of mastery, and for which the required skill could soon be acquired by an adequate number of our citizens all over the country, but for the more difficult and complicated question of how to raise the "ways and means" for doing the work without over-burdening our already heavily loaded farmers. I have seen but little to afford encouragement on this point since I settled in this country, now some years ago. And yet until this problem is mastered, no progress can be made with the work. For the past two years I have been working with this question, with the view of rousing our people to a sense of its importance and, if possible, of convincing them that even "Poor Virginia" might enter upon a work of road building throughout the State which would do more if accomplished to lift her into prosperity than any other work to which she could direct her energies. In the prosecution of this work I have obtained from nearly every county in the State returns as to the present expenditure for road purposes and the average for a number of years past, and also statements as to the amount of statutory labor required from the citizens each year. This I did in order that I might see what was the burden now imposed on the people of the State in connection with the highways, and in return for which they practically receive nothing, for at the end of the year under the present system the roads are no better and no more permanent than at the beginning, and each year the whole expenditure has to be again incurred. This has been going on here for now something like 200 years, and if the amount which has been sunk in the "mud ditches" called roads in that time in this State could be ascertained and stated, it would startle even the most phlegmatic of our citizens. The State debt which has been so long a bugbear and hindrance to our progress, but which, thank God, is now in a fair way for settlement, would be a mere flea bite compared to it. Virginia is not alone in this condition. It is practically the position of affairs in every State in the Union. The question of the roads comes up afresh at every meeting of the different legislatures throughout the country, but no progress is made. Why? Because as in the recent case of New York, when something substantial is proposed to be done, the farmers rise in their might and forbid it on account of the burden which each such scheme proposes to lay upon them, and I cannot say that they are not right in doing so, so far as I have been able to follow the different schemes which have been submitted for enactment. I am as fairly convinced as any one can be that the building and maintaining of the best possible public highways is calculated to be of the greatest possible benefit to the farmers of the country, and will both reduce their expenses and enhance their returns, besides materially increasing the value of their lands; but I am not by this conviction blinded to the fact that they are only one portion of the people and their farms one part of our common country to receive advantage from the carrying out of the work. Posterity will receive the greatest advantage from the building of highways, and this whether living in the country or in the cities. The cities themselves, both now and hereafter, will also receive probably more than a moiety of the benefits to be derived from a good system of roads through the whole country, and yet in the face of these considerations, which to any thinking man would seem selfevident, nearly every scheme proposed to the different legislatures for enactment proceeds on the basis that the present generation of citizens should build and pay for the roads, and these citizens should be only those outside the limits of incorporated cities and towns; that is to say, that the farmers themselves should do and pay for the work, and even this class should be limited to those now owning and farming the lands.* What wonder that they rise and forbid such a burden being placed on their shoulders! They are in the right. But their being in the right, instead of stopping the work, ought only to be an incentive to our statesmen and legislators to devise and perfect some system under which the benefit of good roads can be had without this gross injustice being done. Hitherto I have failed to see any attempt made by these gentlemen to discharge this duty. And yet if they would only turn to the countries of the Old World they might find many precedents for legislation. It is true that some of these would be difficult of application here. These, in the first instance, were imposed by despotic authority, and are now assented to because the people have learned through experience to realize the advantages they have gained from the doing of the work; but there are other systems in force in some of the countries, notably in England, which, with little difficulty, would adapt themselves to our institutions, whether the work was undertaken as a national one or as a state one. I propose to examine and explain one of these which, I believe, from practical experience in its working, would meet our needs and obviate the doing of injustice to any class of our citizens, and, at the same time, afford in its execution enormous present relief to an interest now depressed, and bring substantial aid and prosperity to that interest (the agricultural one) in the future. At the outset, and before explaining the system, I would like to say some-

---

*The author is in error. The "Richardson Bill," introduced into the New York Legislature, provides that the cost of improved roads shall be paid by a tax upon the State at large, and that the payment of the entire sum ($10,000,000) shall be distributed through a period of seventeen years. Only about one-tenth of this burden would fall upon the farming population, the remaining nine-tenths of the cost being paid by the incorporated cities and villages. In a similar way the New Jersey system provides for improved roads in separate counties, to be paid for by an assessment on all the property (city and country) within the county. Among the gratifying results of the practical working of the New Jersey law, it is asserted that in Union County, although a debt of $500,000 has been assumed in the construction of new roads, real property has so rapidly increased in value that the tax rate is lower than before the debt was assumed.—*Editor.*

thing upon the question as to whether the work of building roads ought to be a national or a state one. It may, I think, with great force be argued that it is as much the duty of the national Government to provide highways as to provide or rather care for turnpikes, and especially may it be so argued if there is any force in the views now so prevalent, that the Government should own and operate the railroads. For many reasons, however, I am opposed to such a course. It is true the national Government makes and maintains the main roads in France, which are examples of what roads should be, and that it also does this work in other parts of Europe, but there is a great difference between the people in France and Germany and the Anglo-Saxon race in this country and in England. On the continent of Europe the people are accustomed to the leading strings of government officials from their birth almost to their graves. They are educated at the cost of the government and as the government directs. They are taken into the army and made to serve as soldiers whether they desire or not, and this paternal solicitude is now in Germany extended so that they are provided for in old age by pensions compulsorily accumulated. With such training there is no wonder that the care of the highways is looked upon as a natural duty of the government. But such paternal care is alien to the nature of the Anglo-Saxon race, and the absence of it has largely contributed to make it the foremost factor in the civilization of the world. I would not have it imposed upon the race one iota further than the absolute necessities of circumstances require. The function of government is to enforce law and preserve order, and the closer it is kept to those duties and those alone, the better it will be for those governed. There is much too great a tendency nowadays to invoke the aid of the government in works which should depend for their execution upon the enterprise of the people, and a consequent spread of the principle of centralization. To impose on the national Government of this country the making and maintaining of a system of highways throughout the States would be, in my opinion, to dangerously enlarge its power to the prejudice of individual enterprise, and lead to the ultimate creation of an army of public officials who would fatten on the people and virtually place them at the mercy of officialdom.

There are enough already of this class of people who consider it the duty of the Government to provide for their wants. But whilst thus strongly averse to the undertaking of the making of highways by the national Government, for these and other reasons, amongst which the question of the extravagance of Government work is not the least, I am yet strongly of opinion that it is right that the national Government should go into partnership with the people and the States in making these highways. I believe that in no other way can substantial progress be made within anything like a reasonable period of time, and the system I propose to explain contemplates and provides for just such a partnership, its principle being *national financial aid, with local administration, supervision and execution.*

Under the terms of an Act of Parliament which has now been in force in England for several years, it is the duty of the finance minister of England (the Chancellor of the Exchequer) to make provision for supplying money required by the local authorities of counties and local government districts for executing public works of improvement within those counties and districts. The machinery for obtaining the money so provided is put into operation through a department of the national Government, known as the Local Government Board, of which the president is a member of the cabinet of government. The money needed to meet the calls of these local authorities is provided by the finance minister by loans, issued on the public market and subscribed for by the people. The loans thus taken up are of so popular a character that the minister can always obtain whatever is needed upon the very best terms upon which money is being lent to the nation. In fact, these local government loans often stand in the market higher than any other national securities. The reason for this is that they have a double security, being not only guaranteed by the nation, but also secured by mortgages upon the local taxes of the districts in which they are expended as hereinafter explained. When a county or local government district is desirous of executing some important work of a public character, such as the supplying of the district with water, the making of roads, streets, or other like work, it is enabled under the terms of the Act of Parliament to do this and to obtain the assistance of the national Government, greatly to the relief of the tax payers, on the terms upon which the required money could otherwise be obtained, by proceeding in the following manner: Plans and estimates of the cost of the proposed work made by competent engineers are obtained. These are then lodged with the Local Government Board in London, together with an application for a loan from the national funds sufficient to execute the work. The plans and estimates are carefully examined by competent engineers in the service of the department, which also directs that one of these engineers or inspectors shall proceed to the place where the work is proposed to be done and there (after giving due publicity of the time and place at which he proposes to hold an inquiry as to the proposed work, especially as to the necessity and cost of it) hold a public court at which the promoters of the work (the local authorities) and all other parties may be heard in support or opposition. He must also himself inspect the site of the proposed works, and prepare the plans and estimate. After this local hearing and examination the department decides upon the report of the inspector whether it is right that the application should be granted, and if so, upon what terms, and notifies the local authorities of its decision. In the execution of works of permanent improvement, such as road building, etc., the application is usually made for the period of repayment of the loan to be extended as much as possible, and varies from thirty to fifty years from the time of the granting of the application. The fixing of the period is, however, a matter within the discretion of the department and is mainly determined by the permanency of the work to be done. If the department after receiving the report of its engineer decides that the application is one that should be granted, an order is made providing for the issuance out of the public funds, raised as before mentioned, of the necessary money upon terms just sufficiently higher than the rate at which the national Government has taken up the money from the public to prevent any loss to the national Government upon the working through of the loan; usually from 1/8 to 1/4 per cent. is sufficient to cover this, and if the Government borrows at 3 per cent., which it can readily do, the cost to the local authorities of the loan is not more than 3 1/4 per cent. This alone is sufficient to enable large works of improvement to be effected without being burdensome to the taxpayers, for although English local authorities can usually borrow at much lower rates than are current in the country districts here, yet they cannot without the assistance of the national Government borrow at anything like 3¼ per cent. The length of time also given for repaying the loan is such as to make the total of the sinking fund and interest annually required a very small one. For instance, a $500 loan for a period of fifty years even at 3½ per cent. only requires an annual payment of about $21 to extinguish both principal and interest within that time—on the issuance of the loan, if repayment is secured to the national Government by a mortgage of the taxes of the district collected by the local authority within which the works are being executed, and the money is not advanced to the local authorities except as the works proceed or on their completion. Now what is there to prevent an adoption of this system to the building and completing of a system of highways throughout this country? If the national Government was invested with power to raise loans for such a purpose and with authority to advance to the several states such sums as they might be prepared to expend in making roads through the agency of the county authorities in each state, the security for such loans to be the guarantee of the borrowing state and the mortgage of the taxes of the local authority executing the work, no loss could be sustained by the national Government, and yet each state and local authority could have just the needed assistance at such a rate as would permit of the work being done; or it might be provided that the state itself should make such main roads with money so to be advanced by the national Government as would, when completed, form a part of a national system of roads to cover the whole country and to be laid down by national engineers, leaving the branch and county roads to be afterwards made either by an extension of the system to this object or by state or county action alone.

Once get the country permeated by some trunk roads, the branch ones would soon follow, either through local effort or by the action of the state legislatures in themselves undertaking the work, which would by that time be easy of accomplishment, both as to terms and as to mechanical execution. The only obstacle I see in the way of the adoption of some such system as that I have endeavored to describe is that afforded by the terms of the constitution of some of the states, of which this State (Virginia) is one. By her constitution she is prohibited from contracting any debt except to meet casual deficits in the revenue, to redeem a previous liability of the State, or to repel invasion; nor can she, by the terms of the constitution, become interested in any work of internal improvement, nor engage in carrying on any such work, and a further provision of the constitution that no other or greater amount of tax or revenue shall at any time be levied than may be required for the necessary expenses of the Government or to pay existing indebtedness. In such a case as this provision would no doubt have to be made to amend the constitution, or otherwise to provide for the execution of the works by direct loans from the national Government to the county or other local authorities executing the works. It is difficult to understand why in these days any state should retain in its constitution a provision against borrowing money for the improvement and development of its resources. Such a course would seem only consistent with a determination to prevent its progress except at the greatest cost, instead of seeking to hasten such progress at the cheapest rate. I have not yet explained how the adoption of such a system as I have sketched out could be made to harmonize with the principle I laid down in the commencement of this article, viz., that it should be capable of being put into execution without inflicting a burden upon the existing generation of farmers, except in so far as I have explained the necessity for a long term loan at a low rate. This, of course, secures a lightening of the burden of the tax necessary to be made to meet the debt and interest, but of itself is not sufficient to give all the relief to which the farmer in justice is entitled. The whole country, both cities and counties, reap the benefit of good roads, and the burden necessary to be borne to secure them should be extended so as to be co-extensive with the benefit. In France this is accomplished by the whole cost of the main roads being borne out by national taxation levied alike in city and county. In England this relief is given in two ways. The county authorities have the power given them to declare which roads in the county shall be deemed main roads. After they are so declared their maintenance is provided for by the county partially out of the county tax, which is levied alike over the county and cities within the county, and as to the residue, out of national taxation set apart by the finance minister of the country for that especial purpose, and by him handed over to the county authorities. This national taxation so used is derived mainly from death duties—that is, taxation levied on the estates of deceased persons on taking out probate or administration, and from license duties. In this way the farmers in the counties are relieved to a very large extent from the cost of the main roads, and are only wholly responsible for the subsidiary or township roads. The repayment of loans contracted for the making of local improvements in the manner herein described being charged on the county taxes, is borne equally by all the inhabitants in the county, whether living in the cities or counties, the county tax being assessed over all the property within the county, including that within city boundaries. If such a provision were made here, then the farmers would have no ground for complaint against an application of a system of national loans—adequate to provide main road facilities throughout every state. In this way only does it appear at all possible for such a system of roads as we need to be provided. No scheme for annual appropriations by Congress out of the revenues of the country, such as is made for improving water ways, could be at all adequate to meet the needs of the case, and it would have the objectionable feature that so militates against the completion of the works on the water courses of the country, that each session of Congress could spend a large portion of its time in discussing to what particular place any appropriation should be made, and how much should be allowed with the same result—as is so apparent with reference to the streams, that nothing permanent or satisfactory would be done. It would be fragmentary work dotted all over the country, in accordance more with the political necessities of the case, rather than the actual requirements of each section. Every state and section willing and ready to satisfy the requirements of the law as to the work to be done and for repayment of the money borrowed, should be able to obtain that assistance necessary to enable it to build roads without having to rely on the persistence of its political friends, or to suffer from the ill will of its political enemies.

Under such a scheme as I have foreshadowed, this would be the case. I think I have now suggested a plan that is possible and practicable, and which satisfies the conditions I laid down at the outset of this article. It is one capable of application to the whole country if national help is to be granted, or it could be made available for the working of simply a state system in all cases where the states are not restricted by their constitutions from borrowing. It provides for the burden of making the roads being so extended as to leave a part of it to be discharged by that posterity which will reap the greatest part of the benefit, and the area over which the cost is levied is so extensive as to relieve the farmers from an undue proportion of the burden so long as it exists. Now what could be accomplished in even so poor a State as Virginia if such a system as this were in operation? From the statistics which I have gathered from the most reliable sources throughout the State, that is to say, from the county authorities themselves, I find that the average annual expenditure for the past three years in this State in actual cash for road purposes has been $356,332. In addition to this, I estimate that the average annual value of the statutory labor which has been required from the farmer, taking the value of his labor at only $1 per man per day, has been $413,994, or a total annual outlay of $770,326, and yet we have not more than a few miles of roads within the State worthy of the name. And this expenditure goes on from year to year increasing rather than decreasing, and each year's end finds the work no further advanced than at the beginning. Taking only the actual cash outlay of $356,332 annually into account, for I would in hinging the new system into operation absolutely abolish all statutory labor, as it is an injustice to the farmers and a most wasteful expenditure of time and labor, and has never yet in any country succeeded in producing results which bore any proportion to its cost—this sum would, if applied in payment of sinking fund and interest on the basis of a fifty-year loan for 3½ per cent. interest, provide a capital sum sufficient to build a long mileage of permanent roads throughout the State, and yet, under the proposed scheme, this would not be all the money available for that purpose, as the cities of the State pay no part of this $356,332. It is all levied from the farmers in the different counties. The cities in this State have an assessed value of about one-third that of the counties, and they would therefore have to provide towards this road fund, under the scheme suggested, about $118,770 per year. Adding the two sums together, we have an annual sum of $475,109 available for payment of sinking fund and interest upon a road loan without calling for one single cent of increased taxation from the farmers of the State. This sum would suffice in fifty years to extinguish a loan something like $11,000,000 upon the basis stated. What a work of road building throughout the State would this sum accomplish! An expenditure of from $1,500 to $2,000 per mile would suffice to make good permanent macadamized roads of sufficient strength to carry the average traffic of almost any county in the State, except in the neighborhood of the large cities, and even there the expenditure need not exceed twice this sum per mile, as there is an abundance of the best materials to be had for building the roads in almost every section of the State. If this could be done in so poor a State as Virginia, what might not be done in the richer states of the North and East. Surely a consideration of these ideas and facts should lead to a determination on the part of every state to press this matter of road building upon the attention of both national and state legislatures, and a fixed resolve to remove from this great nation the stigma of having the worst roads of any civilized nation in the world. I have not mentioned the relief which would be given to land by the expenditure of so large a sum as would be necessary to execute the works in the shape of payments for labor and materials. This of itself would go far to silence the demand for the issue of money in any form, be it only called money, now so prevalent and so dangerous. The accumulated millions in the cities would be poured out over the country, and be expended in the payment of legitimate claims for materials and labor, and would stimulate trade and would bring contentment and happiness to the people. It would do more to prevent the growth of socialistic and dangerous theories on monetary questions than can easily be imagined, and this is not one of the least of the arguments which may reasonably be urged in favor of the plan. In the present temper of the farmers, egged on as they are by the unscrupulous and designing men, anything which in a legitimate way can improve their position without tending to lower them as a class or lead them to place the duty of satisfying even the most outrageous demands upon the Government, ought to be encouraged. An expenditure on the making of roads would be an outlay reproductive in its results and directly and indirectly lead to the permanent advancement and contentment of the largest class of the people in the country, whilst at the same time doing no injustice or injury to any other class. The magnificent roads of France and England are largely to be thanked for the prosperity and contentment of the people of those countries, and a similar result would no doubt follow their introduction here, to the infinite disgust and dismay of those now trading on the simmering discontent of a large class of our people.

THE COUNTRY ROAD.

THE pathway of life may be narrow and steep;
  But the road through the country is steeper
The pitfalls and snares that beset us are deep;
  But the mud that surrounds us is deeper.

There are fence-rails for bridges and mud holes for drains,
  And hard heads and boulders for gravel;
And broken down buggies, on hillsides and plains,
  Give warnings, like ghosts, as we travel

Lank horses, by work and abuse broken down,
  Gaze at us from road-side and stable.
Young men reaching wistfully out toward the town,
  Or seeking its portals when able.

Deserted farm houses; the fences decayed,
  And the breezes through weed patches blowing,
Where once happy children rejoiced, as they played
  Hide-and-seek, when the field-corn was growing.

What joy for the youth, as his longings expand,
  In a life so restricted and narrow;
His prospect, 'mid all opportunities grand,
  But to follow the plough and the harrow.

Half banished from hope, and shut out of the world,
  By a flimsy but tangible curtain;
Society's pleasures away from him hurled —
  The roads are "so very uncertain.

There's little enjoyment in life scattered 'round,
  And little of profit or pleasure,
In roads where the bottom can scarcely be found
  With less than a seven-foot measure.

Let us seek some reform then, at once, e'er we lose
  All trace of our roads from our annals;
And make surface roads that the public can use,
  Or else take the underground channels.

WILDER GRAHAME.

ROADS OF THE HAVRE DISTRICT.

The following questions were propounded by United States Consul Oscar F. Williams to the French Road Engineer Vacossin, of the Havre district, and appended to each question is the answer received. The numbered paragraphs (following the questions and answers) are made by Consul Williams from his own observations on the roads and roadways:

Q. Are all people and occupations permitted use of all roads for loads of every weight at all times and without tax? If not, indicate exceptions, restrictions and tax.—Answer. Restrictions can be made to regulate the use of roads having great declivity or imperfect lines; for extraordinary damage a fine or tax is collected which goes toward the expense of repair. (Art. 14th, law of 21st May, 1886).

Q. Are owners of abutting lands taxed for road building and repairs?—Answer. No.

Q. Are country roads swept of dust and mud or is the dust removed by winds and rains?—Answer. The roadmen are obliged to take away the dust and mud.

Q. At what distances apart are heaps of broken stone deposited for use in repairs?—Answer. The materials are laid according to necessity per lots, 1 cubit metre (1.308 cubic yards) alternately from right to left at a distance of 50 metres (9.9 rods), and outside of the lines of the road.

Q. After a new road is completed is it ever again entirely made new, or is it perpetually maintained by repair of its surface?—Answer. The surface of the road is constantly kept in repair.

Q. For what average time in years have the principal roads of this portion of France been kept up by means of scientific state supervision?—Answer. Since 1836; application of the law of May 21, 1836.

Q. Is it centre-drained?—Answer. No.

Q. Is it drained other than by side ditches?—Answer. Yes, for departmental roads; the communal roads have no ditch.

Q. Is the centre arched, and if so, to what height above the gutter?—Answer. No.

Q. What is the usual width between gutters?—Answer. Six metres (19.68 feet) for the departmental roads. The communal roads are of variable width, from 4 to 6 metres (13.12 to 19.68 feet) exclusive of ditches.

Q. What incline is allowable ?—Answer. The profile in length presents no declivity above 5 centimetres per metre (equals 1 foot in 20 feet); the width profile having the form of an arc of a circle given a convexity of 13 centimetres at the axle, so 1 in 31 of the width.

Q. Is more than one sort of paving material used; how combined or placed ?—Answer. Generally the paving stones used come from the quarries of May St. Valeny en Caux or Cherbourg; the paving stones are laid close to each other on a layer of sand 15 to 20 centimetres (5.904 to 7.872 inches) in thickness.

Q. What is the thickness of the paving coating, and how is it compressed and to what weight per square centimetre of contact with roller or compress?—Answer. The paving stones have generally the following dimensions, viz: Length 24 centimetres (9.45 inches), width 17 centimetres (6.69 inches), depth 18 centimetres (7.08 inches); or, length 20 centimetres (7.87 inches), width 13 centimetres (5.12 inches), depth 18 centimetres (7.08 inches). The pavement is leveled with a beetle, the weight of which is 30 kilograms (66 pounds) and which firmly imbeds every stone.

Q. What is the cost per cubic metre (1.308 cubic yards) of breaking stone to suitable size ?—Answer. 1.75 francs (34 cents).

Q. What is the variety of stone so used?—Answer. Country flint, or the sandstone of May or Cherbourg.

Q. To what size is it broken? If more sizes than one are used, give extreme sizes and proportions of each as used.—Answer. Uniform size, the minimum 4 centimetres; the maximum 7 centimetres (that is about 1½ inches and 2¾ inches).

Q. What material is used to bind the broken stone, and in what manner and when is such binding material supplied?—Answer. Clay, sand or earth from the excavation when such is suitable. These materials are put on after the steam-roller has been once over the road and then continued until complete aggregation.

Q. What is the total cost per kilometre (198.84 rods) of a section of new country road?—Answer. Twelve thousand francs (per kilometre) for all sorts of work which concern the establishing of a road like the type profile hereunto annexed.[*]

Q. What is the average total cost of such a completed new road per square metre (1.196 square yards)?—Answer. The above price is to a minimum of 8,000 metres (square per kilometre of road distance), and gives 1.50 francs (39 cents) per square metre.[†]

Q. For what length of time after completion is such new road permitted to be used without repair?—Answer. The roads are immediately put under constant supervision.

Q. In what manner is its cost paid? by whom?—Answer. The cost of the departmental roads is paid with part of the communal budget united with the departmental subsidy. (Approved budget by the general council.)

The communal roads are paid for from an appropriation from taxes collected in the locality. (Approved budget by the municipal council.)

Q. In what manner are repairs paid? by whom?—Answer. The same answer as last above.

Q. What is the average annual cost for repairs of such a road per square metre?—Answer. Departmental roads, in country, 10 centimes (2 cents); in town, 17 centimes ($3\frac{2}{5}$ cents); communal roads, 6 centimes ($1\frac{1}{5}$ cents). These prices include sweeping, removing mud, watering materials, and the maintenance of all works.[‡]

Q. What length of such road can one man keep in repair throughout the entire year?—Answer. Departmental roads, 4,000 metres (2.485 miles). Communal roads, 8,000 metres (4.97 miles).

Q. In what manner are the road engineers, superintendents, assistants and workmen chosen?—Answer. The engineers, agents, clerks, etc., are chosen by competition. The roadmen and superintendents are generally chosen from among countrymen who know all about this kind of work.

Q. How much are they severally paid, how long do they serve, and by whom are they paid?—Answer. *The service*

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[*] This equals 70½ cents per lineal foot; $11.64 per lineal rod; $3,725.64 per lineal mile.

[†] This equals $7.32 per square rod.

[‡] Average yearly expense of repair equals departmental roads. In country, $248.48. In town, $422.41. Communal roads, $149.09 per mile of road the width as considered.

organization. One chief trustee of roads to the chief town of the department; one trustee of roads to the chief town of the neighborhood; one trustee of roads to the principal district of the neighborhood; one brigadier per brigade of ten roadmen to superintend 40 kilometres (24.8548 miles) of road. This gang has to do all that is required for the communal roads. The employed are paid from funds explained above. Salaries are as follows, viz.: Chief trustee of roads, yearly salary is 10,000 francs ($1,930) trustees of roads, neighborhood, salary 5,000 francs ($965) per year; trustee of roads of district, 2,000 to 3,200 francs ($386 to $617.60) per year; employés, agents, 1,200 to 1,800 francs ($231.60 to $347.40) per year; chief roadmen, 900 francs ($173.70) per year. Indemnity of residence and office expenses are paid according to the importance of the locality. The employed have a pension after thirty years of service.

CONSIDERATIONS IN ROAD MAKING.

1. The perpetual advantage of an easy grade should be secured at the beginning.

2. Straight lines are best, and on like grades are cheapest; it is economy, however, to secure easy grades at the expense of straight lines where such grade is otherwise unobtainable, because the perpetual advantage to all users of the road more than offsets the disadvantage to the land owner from ill-shapen fields.

3. Capacious middle blind drains in all roads will dry the soil in Summer and minimize the damage by frost in Winter.

4. Side drains should never be omitted.

5. If natural soil of road be arched at centre its drainage will be easier.

6. All stones liable to disintegrate the road surface should be rejected.

7. Comparatively large cost is unavoidable; cheaply made roads will prove the most expensive roads.

8. Material should be carefully selected, durability and cheapness, when prepared, being first considered; then by using local stone local labor may be employed, and so by outlay for stone and labor each locality will to an extent be benefited directly by the distribution of the money cost of the road in such locality.

9. The common field boulder, more or less a nuisance on American farms, is of a strength and durability equal to the average quarry stone; both its purchase and removal would benefit the farmer and its preparation would benefit the local laborer, and thus go far to reconcile both to the expense of the improved road.

10. Every county should own and operate at least one steam road-roller.

11. Road sweepings, except manure, and common sand and clay make suitable binding material over broken stone.

12. In making a new road wetting down or sprinkling has been proven injurious; such practice is wise in repair, as then the binding material is solidified, while the water does not penetrate the surface coating to soften or weaken it.

CONSIDERATIONS IN ROAD KEEPING

1. Repair should never be delayed.

2. Scientific supervision is essential.

3. Wetting down aids repair by helping the new added material to adhere to the old.

4. For repair, especially of large areas, as well as for construction, a steam roller effects great economy.

5. The use of wide tires should be encouraged either by bounty on such or by tax on narrow ones.

6. Four-wheeled freighting vehicles should not track; the hind wheels should roll outside the track of the fore wheels.

7. Local tax for maintenance tends to prevent local misuse, promotes local supervision, and prompts repair.

8. Our people may, in order to equitably adjust cost of road, fix a tax upon their use so that he who drives much and owns little assessed property may pay a just share for the road he uses.

GENERAL CONSIDERATIONS OF ROADS

1. Increase of railroad mileage seems to lessen local interest in highways, but it should not be forgotten that nearly all railroad freight has been previously carted over highways.

2. As steam road engines become more in vogue, roads and bridges should be strengthened accordingly.

3. As bicycles and other "wheels" become used by business men, roads should be fitted therefor to every reasonable extent.

4. The use of springs on freight wagons greatly diminishes

the jolt or falling force in road depressions, prevents ruts, and preserves roads.

5. The effects of wheels of large diameter and width of tire is to greatly diminish spot pressure, and the breaking of the road surface is thus obviated.

6. The reduction of cost of transit of persons and freight by lower prices for liveries and for hauling would be beneficial, and as transportation is a large element of cost to everyone not a producer, good roads would much cheapen living.

7. The cost of transporting products or of hauling to market is by tenfold the highest tax now paid by our farmers and hucksters.

8. The cost of highway transportation over the properly built roads of France does not exceed one-third the like expense in the United States, it being common in the rural districts of France to haul 3 tons, and in the cities from 3 to 5 tons, net freight, with one horse.

9. In this way the good road saves the farmer each year much more than its cost, and we may ignore the increased pleasure in its use.

10. If 2 horses haul the load of 4, 1 wagon of 2, 1 set of harness of 2, 1 driver serve for 2, and if 6 miles instead of 3 be passed per hour, the aggregate saving would double the net income of the average huckster or farmer.

11. Land values are increased by improved roads. This effects 1st, increased assessment and taxes on lands abutting because most benefited. 2d. This increased assessment reduces per cent. of tax and tax on lands not abutting, and which are hence less benefited.

IMPORTANT.—Read announcement of "State Editions" of GOOD ROADS in our advertising pages. It is a new and interesting feature.

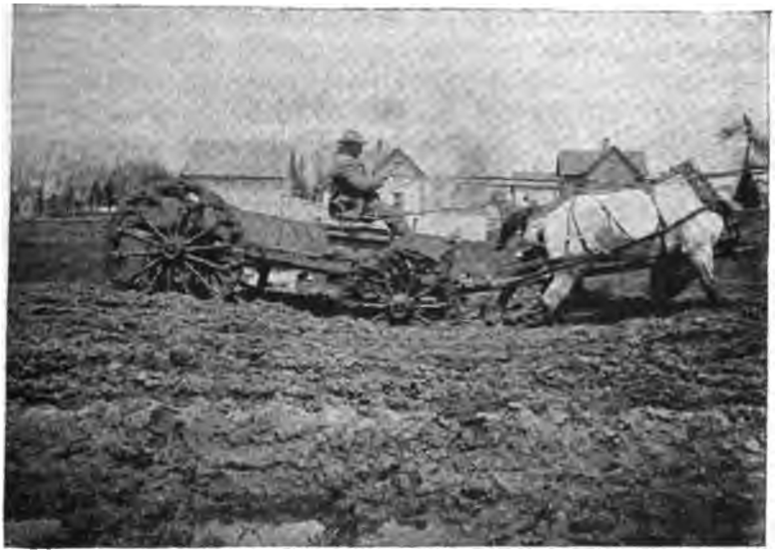
THE WHEELMAN AND THE PUBLIC ROADS.

A Cyclist's Letter to his Wayback Uncle.

IV.

And so, my dear uncle, you see that the wheelman is not to be wholly condemned because of his vehicle, for to thousands of excellent people the bicycle is a refuge—a means of self-preservation—and self-preservation is the first law of nature and of nations. Now don't fall into the idea that all wheelmen are invalids, or that the bicycle is a part of the paraphernalia of a hospital. I have mentioned its value as a health-giver only to show you that its use is justified by the highest rule of civil conduct, and, incidentally, to commend it to the attention of some of the physically woe-begone young men in your neighborhood.

If my recollection is not wholly astray you have among the budding citizens of Slowtown, some two or three dozen sallow, angular, liver-distorted and dyspeptic specimens, who have neither the physical capacity for sawing wood nor external meekness enough to encourage the neighbors to send them to theological seminaries; and when I was last up at the old farm they were chiefly engaged in maintaining an animate circle around the bar-room stove at Staggers' tavern, where they practiced the accurate manipulation of tobacco juice and laid out a wise course of procedure for the next legislature. I am not in any way sure that the use of a bicycle would add to the statesmanlike qualities of Mr. Staggers' customers, but I have digressed a little from the main object of my letter, to suggest that a little outdoor exercise, even of bicycle riding, might help to put these wrecks in working order and set them afloat once more in the sea of local usefulness.



"A CONUNDRUM WHICH I ASK YOU TO SOLVE WHEN YOU LOOK UPON THIS PICTURE."

And now I am going to tell you that the bicycle is not only a very useful and practical means of conveyance, but, to go a little further, and still keep within the wide field of reason, I propose to show you that the bicycle is essentially the poor man's vehicle and that the best of reasons exist why every prudent farmer should own and ride one. I am aware of the difficulties that stand in my way when I attempt to convince you of these facts; but I am only fighting the old fight that has ever been waged by improvement against prejudice, and have for my encouragement only the assurance that one man in the right will some day become a majority. Most of the things that we do in this world are done by force of habit, and the things we oppose are those things which oppose our daily methods. "Custom is the universal sovereign," says one author, and "Men do more things from custom than from reason," says another. To illustrate: There is no earthly reason why you should tolerate the dirt road that leaves you plunging along between farm and market, hub-deep in the mud for three months in the year; but custom, habit and an ignorance of the real value of a good road have put your reason to sleep, and I have concluded to send you the photograph on page 207 and to ask you to tell me in all candor whether you think there is anything in that sort of a road to lighten the farmer's burden or to invite prosperity into the Slowtown district. Just why an intelligent farmer should defend the maintenance of a mud road and condemn the struggling wheelman who aims to make it better is a conundrum which I ask you to solve when you look upon this picture.

But I was about to tell you something of the usefulness of the bicycle and to suggest some reasons why it should be entitled to your friendly regard.

You have not been accustomed to the sight of a bicycle and still less have you made yourself familiar with its value; therefore you question the wisdom of the wheelman and sometimes condemn his vehicle. Let us see how far your hasty judgment is justified by facts. You live only three miles from town, and sometimes you and your immediate neighbors make the journey afoot. I have seen you trudging along, putting one foot before the other, and at the easy gait popular with the Slowtown farmers, and you cover the distance in about one hour.

The length of your step is some twenty odd inches, and very often the bad road makes the journey a slow and tiresome one. In going over these three miles from your house to the village post-office you step about nine thousand times, and each time you lift and shift your two hundred pounds of avoirdupois from one foot to the other. Long use has hardened your muscles and made you think little of this exertion; but long use has not decreased the time wasted by this slow means of travel, and within your own range of personal locomotion you have no means of improving it. Now, if you will notice the next wheelman who rides a bicycle down the old road, you will see that he goes along placing one foot before the other, somewhat after the style of a man who walks; but a marvelous contrast of speed is apparent between the bicycle and the pedestrian, due largely to the fact that each "step" of the wheelman carries him over a space of about sixteen feet, or eight times the distance of the footman's step, to say nothing of the fact that the wheelman's weight is largely supported by the saddle on which he sits, and that his legs and feet are relieved from much of this weight the pedestrian must carry.

It has always seemed to you that bicycle riding requires a continuous and tiresome effort, and that much of this effort is exerted in keeping the machine upright or "balanced." You are strangely at sea on this point, for to ride a bicycle is a thing most easily and quickly learned, and the question of keeping the machine upright is one which seems to be solved by the rider's instinct; for, as he goes down the road, he gives scarcely more thought to his "balance" than do you when you ride to church in your carriage. If you will look into the philosophy of its mechanism, you will soon find that the bicycle has an immensely larger base or supporting area than you have ever imagined. It can be made to balance under the most difficult conditions, and in its present "safety" form a personal injury is a wholly unnecessary if not an impossible occurrence. I have known men who learned to ride a bicycle in less than twenty minutes, and within my somewhat extended experience no learner has ever required more than three or four short lessons to make him fairly proficient in the use of his wheel. It is vastly easier to learn than walking. Do you know that learning to walk is one of the most difficult things you ever did?

"IT CAN BE MADE TO BALANCE UNDER THE MOST DIFFICULT CONDITIONS."

When a child begins to take its first steps it lacks neither strength nor the intelligence, but rather the skill necessary to balance its erect body upon the small base presented by the sole of its foot; and to shift its weight from one small base to the other by a succession of steps is a very ponderous problem to the baby's mind, and well it may be.

V.

Then you have sometimes suggested to me that bicycle riding is dangerous. Not at all. By this I mean that it is not dangerous when compared with other means of locomotion. The bicycle always acts the same under the same conditions. It is controlled by the wheelman, and acts in obedience to the force which he exerts upon it. It is not, as in the case of driving a horse, controlled and drawn by the separate intelligence of a beast, and the records kept in our large cities show that the number of accidents upon the streets and parkways is much greater in proportion among the riders and drivers of horses than among wheelmen. On the country roads the proportion in favor of the wheelman is still greater; for in passing over a

"THE WHEELMAN CAN AVOID RUTS AND DANGEROUS PLACES WHICH A FOUR-WHEELED VEHICLE IS LIKELY TO FALL INTO."

miserably kept highway the wheelman can avoid ruts and dangerous places which a four-wheeled vehicle is likely to fall into. No one is better aware of these facts than is the wheelman himself, and well he knows that nine-tenths of the few accidents occurring to bicycle riders, are due to reckless riding and to the miserable condition of the roads.

It is due to these facts that the bicycle has made its way in every community where it has become known and understood. Go with me to any of the large manufacturing cities of New England and I will show you hundreds of bicycles leaning against the outer walls of the factories, having carried their owners from homes to workshops where they are left at the door in readiness for a trip over the same route at the end of the day's work. They have been adopted into the army service of several of the most powerful European countries and by our own Government. They are used in England, France and Germany by men of all ages, trades and professions, and a fair estimate would probably place the number of bicycles in use in those countries at not less than one million. In our own country hundreds of thousands of dollars are invested in their manufacture and they have gained so strong a hold in every civilized community that even the farmers are beginning to appreciate their value and to use them in their frequent journeys over the country road. Hundreds of inventors are constantly at work devising new improvements for making the bicycle lighter, stiffer, easier to ride, more comfortable to the rider and cheaper to the buyer, and the march of progress has been so determined in this respect that an almost perfect result has been attained.

And so it is, that the bicycle has become a convenient, comfortable and speedy vehicle. It is the swiftest, stanchest, cheapest and most convenient means of transit within the range of personal ownership. It enables you to ride the distance from your house to the market in one-fifth the time that the journey afoot would require, and you could easily mount a bicycle and ride the distance from farm to town in a little more time than you would consume in hitching up your horse in the mere process of getting ready. It has covered a distance of more than 400 miles in a day on a track, and more than 300 miles on a common road, and while these are the records of hardy and accomplished riders, there are thousands of men in our own country who can ride 100 miles a day on a good road and keep it up from one end of the season to the other. In short, for quick and easy transit over the common roads, the bicycle is incomparably superior to any other vehicle used by man. It is many times stronger though many pounds lighter than your buggy, and a really good bicycle is handsomely designed and as smoothly and accurately put together as the works of your watch. You know how many times we have laughed together at the consternation of old Deacon Fossle, and at the queer remarks he made the first time a bicycle went past the Slowtown post-office, some six or seven years ago. The deacon said it was a "weak wobbly thing" and "looked like it was made of barrel hoops and cobwebs." He delivered himself of the profound opinion that a "good sized man would squash that machine all to pieces in about two minutes." In spite of the fun we had at the deacon's expense, it must be said in all soberness that his speech reflected in a somewhat extravagant way the common sentiment of his neighbors. You, too, my dear uncle, have harbored some doubt as to the strength of the bicycle, and its capacity to carry the weight of a robust farmer. Look at the picture on page

206. I have had it reproduced for your special benefit and I invite you to show it to all of your Slowtown neighbors. The bicycle shown in that picture is an ordinary "roadster," similar to half a million others in every-day use, and the six persons whom you see supported on those two slender wheels represent a combined weight of more than 800 pounds. Of course a bicycle is not made to carry six persons, but the strength is there, and you may take my assurance that a 200-pound farmer might ride that machine for the balance of his life-time without incurring any serious risk of its giving way under his weight. My own bicycle weighs less than twenty-nine pounds, and while I would not recommend so light a machine for general use on rough country roads, I find it to be a rigid, comfortable and easy running machine that carries my 160 pounds weight with ease and safety, and I ride all reasonable distances with it without accident and without apprehension.

Now as to the question of cost. The bicycle is an ever-saddled horse that eats nothing and never gets tired. Every horse in your barn costs you at least twenty-five cents per day for food, care, shelter and maintenance—a sum quite sufficient to pay the yearly cost of keeping a bicycle, provided you give it the slight care necessary to keep it clean and in running order. The first cost of a good substantial bicycle ranges from $90 to $135, and beyond the latter sum every dollar you pay is a needless expense. Every responsible dealer will sell a bicycle to a responsible farmer on very easy terms and so the burden of first cost is so reduced as to be scarcely felt. Once in your possession you will find the bicycle to be the most useful, convenient and economical investment that could be made in the purchase of a road vehicle. I have touched upon these points because I know you lack information and it is necessary that we should both be informed as to the facts before we can agree as to our conclusions.

(*To be continued.*)

SPECIFICATIONS FOR CEDAR BLOCK PAVEMENT,

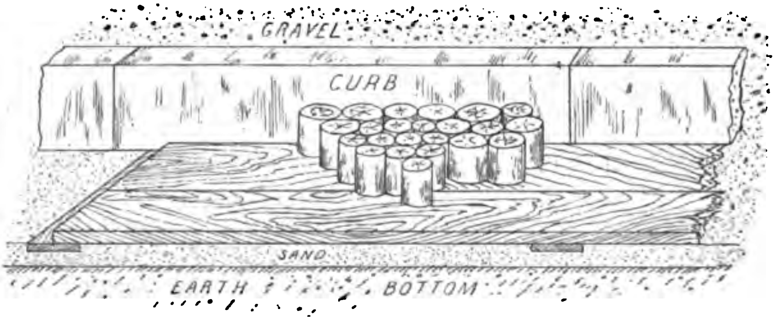
AS ADOPTED BY THE CITY OF ST. PAUL, MINN.

Grading.—The street shall be graded to conform to the grade as given by the engineer and thoroughly puddled, rammed and rolled with a fifteen-ton steam road roller to a uniform surface.

The filling shall be of sand, clay, earth or gravel, free from any animal or vegetable matter, or any perishable material, and shall be put in layers not more than two feet thick, well puddled and rammed, and made so firm and compact as to be secure from settling; the filling to be brought within eleven inches of the top of the pavement when complete.

Where rock is met the foundation shall be excavated six inches below the bottom of the plank flooring, and refilled with clean sand or gravel, which shall contain no pebbles larger than one inch in diameter.

Curbstone.—The curbstone shall be of a sound, durable granite, free from cracks or seams, straight, five inches thick when dressed, not less than five feet long and eighteen inches deep. The top face, for nine inches from the top, and the back for four inches from the top, shall be dressed to a true surface. The ends shall be dressed smooth so as to make close joints two inches deep on top and on the face for not less than one foot down from the top. The curb shall be set to the exact lines and grades as given by the engineer, in six inches of sand on



SIDE VIEW AND SECTION OF ROADWAY AND CURB, SHOWING METHOD OF CONSTRUCTION.

a solid foundation, and the filling back of the curb shall be of good gravel and well rammed so as to hold the curb firmly in place, said filling to be brought even with top of curb for three feet back from the curb.

Corners shall be made as shown on plans, and where catch-basins are located such openings shall be made in the curbing as shall be directed by the engineer.

Foundation.—A bed of clean sand or gravel not less than three inches in depth, containing no pebbles larger than one inch in diameter, shall be smoothly and evenly spread over the surface of the street and compactly rammed and rolled down.

A flooring of two-inch sound common white pine or hemlock boards, not less than ten inches wide, to be laid lengthwise of the street, close together, upon one-inch by eight-inch pine stringers under the ends and centres ; stringers to be firmly bedded in the sand. A pine curb four inches by sixteen inches shall be placed at the outer edge of the pavement at the street crossing, to support the blocks, and is estimated in number of square yards of paving.

Paving.—Sound, live, four-inch to eight-inch cedar blocks, free from bark or other defects, exactly six inches long, the ends to be sawèd exactly parallel, shall be placed upon the floor in close contact with each other. Blocks larger than eight inches in diameter shall be split.

The pavement must be kept quite close, well driven up and entirely free from square holes and each block must be carefully set in its place, properly resting on its base ; and whenever any blocks are found loose, or with any knots or bark on them, or otherwise defective, all the pavement afterwards laid shall be taken up and properly relaid at the expense of the contractor; and where blocks are split, sufficient must be cut off the edges to form proper joints with the adjacent blocks, and no two split blocks shall be allowed together, nor shall any portion of rejected blocks be used.

The spaces between the blocks (which shall not be larger than one inch and a half, nor less than three-fourths of an inch in diameter) shall be filled with clean, screened, dry gravel, all of which shall pass through a screen with openings three-fourths of an inch square, and none of which shall pass through a screen with openings three-sixteenths of an inch square, and be thoroughly rammed with proper tools by competent and experienced help, to the satisfaction of the engineer, and again filled with the same kind of gravel and likewise thoroughly rammed. The pavement shall then be flooded with hot composition, not less than one and one-quarter gallons per square yard, after which clean, dry gravel of the same kind shall be spread over the pavement in such quantity that, when swept, all the spaces between the blocks shall be thoroughly filled. Then the whole surface shall be again flooded with hot composition, not less than three-quarters of a gallon per square yard, and immediately covered with dry gravel, all of which shall pass through a screen with openings one-half inch square, and none of which shall pass through a screen with openings three-sixteenths of an inch square, said covering to be not less than one-half inch thick.

The composition will be distributed with a three-gallon kettle, and will be done in sections, as the engineer may direct. An account of the composition used will be kept and if the full amount above required is not used, the balance will be deducted from the contract price at the rate of thirteen cents per gallon.

The graveling and tarring must be completed each day to within fifteen feet of the end of the paving, and the top dressing to within fifty feet. If the gravel and pavement become wet before the tarring is completed the same may be ordered taken up by the engineer.

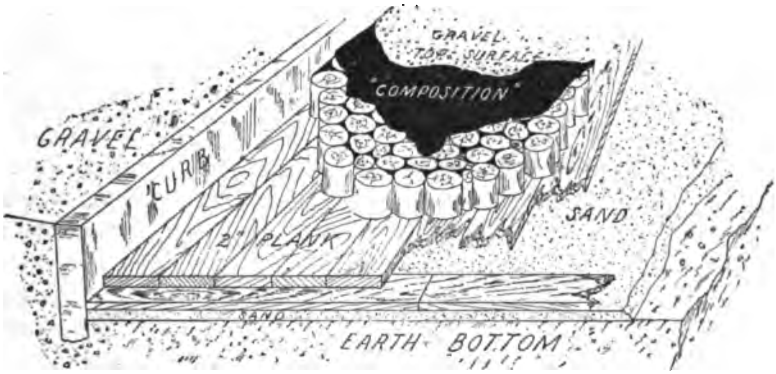
All composition to be equal to Barrett & Arnold's best paving composition, distilled at 400 degrees Fahrenheit, and used hot. All gravel used to be dried and heated enough to prevent the chilling of the composition.

Cross-Walks.—There will be two cross-walks at each street intersection or half-intersection. Said cross-walks to be eight feet wide, and so constructed that the centre of the walk will be level, and to such grade as directed by the engineer.

The contractor will be required to take up and relay any sidewalk that may be found necessary. In so doing he will not be allowed to cut off any planks, without taking up the walk. In all cases where catch-basins come at the corners a hole must be cut in the curb, and the hole is to be cut entirely in one piece of curb, and in no case at a joint.

All man-hole and catch-basin covers will be brought to grade and line by the city, and the contractor shall afterwards fit the pavement and curbing to them in a neat and substantial manner, to the satisfaction of the engineer.

Masonry.—Masonry shall be built of sound quarried stones, squared, none of which shall be less than four inches thick, nor have a less superficial area than two square feet. Each stone shall have a level bed and a firm bearing on the stone below, and all joints on the face shall be broken at least six inches. The whole to be built in a substantial and workmanlike manner, and laid dry or in mortar as ordered.



VIEW AND SECTION OF ROADWAY, SHOWING MATERIALS AND FORM OF CONSTRUCTION.

Mortar.—Mortar shall consist of one part of fresh hydraulic cement, approved by the engineer, and two parts of clean sharp sand; the same to be first mixed dry, in a suitable box, then wet with clean water when wanted for use, and used at once, and none remaining on hand long enough to have begun to set, shall be used; care must be taken to use only enough water to properly temper the mass.

Concrete.—Concrete shall be made of equal parts of mortar as above described, and clean, crushed stone, free from dust or dirt, and broken so as to pass through a two-inch ring, shall be thoroughly mixed together, under direction of the engineer, and put immediately into the work.

House Drains.—Before the street is paved such six-inch house drains will be required to be connected from the street sewer to the property line as the Board of Public Works may direct.

Bidders will be required to bid the price for which they will make each connection, in accordance with the following rules and regulations:

1. All house drains and private sewers (except in the sandrock district) shall be constructed in open trenches,—except by special permit from the engineer, in writing,—carefully excavated in the proper direction, and to such width and depth as may be necessary to secure correct alignment and faithful execution of the work, which latter must be vigorously prosecuted, so as to cause the least possible inconvenience to the traveling public.

2. If the sides of the trenches will not maintain their vertical position, they shall be sheeted, shored and strongly braced.

3. Prior to commencing the excavation, all materials composing the sidewalk, roadway, paving and other similar improvements, will be carefully removed and piled in some convenient place, and placed in such a position there as will insure their safety, and where they will be out of the way of the street traffic, and of all material taken out of the trenches, which latter must be likewise so disposed of as not to interfere with the legitimate use of the sidewalk.

4. Should gas or water mains, or other pipes or drains be encountered during the progress of the excavation, the same shall be carefully protected against injury or settlement.

5. Whenever it may be found necessary to pass through or in anywise disturb an existing house drain or private sewer in actual use, such drainage pipe or private sewer shall not be interfered with, nor cut through, nor connected in any way, without the written consent of the City Engineer having been previously obtained thereto; nor shall any house drain be carried immediately above or through a wooden drain—no matter whether the latter is in use or abandoned—nor through unstable or perishable material of any character, unless all such work be carefully placed upon a foundation of puddled earth, concrete, brick or stone masonry, of such dimensions and methods of construction as may be directed by the city engineer.

6. The least inclination that can be allowed for water-closets, kitchen and all other drains of not over six inches in diameter, liable to receive solid substances, is one-quarter inch per foot, and for cellar and other drains to receive water only, one-quarter of an inch in two feet.

7. The ends of all house drains not to be at once connected with the interior drainage or other sanitary fixtures, shall be

securely closed with brick masonry or otherwise, so as to be rendered absolutely impervious to the surrounding material in which the pipes are imbedded.

8. Whenever a drain pipe is connected with a temporary receiving basin for draining excavations made for the foundation of buildings, or for any other purpose, the open ends of all such pipes shall be covered with some form of screen, and the drain layer or contractor will be held strictly responsible for all expenses that may occur for moving all materials from out the main sewer which may have found their way therein, by reason of the negligence of himself or his employees.

9. All pipes shall be laid upon firm foundations, fair and true to line, so that the inspector can see from one end of the pipe to the other. For this purpose a T pipe shall be inserted at the end of the curve, near the sewer, with the T up.

10. After the foregoing work has been finished and properly inspected, the back filling will be commenced without delay, and during its prosecution, as fast as it is deposited in the trench, it shall be thoroughly puddled and tamped to such an extent as to render subsequent settlement of the surface practically impossible.

11. The clay pipe shall be straight, smooth, thoroughly burned, vitrified and salt-glazed, free from lumps or other imperfections, with no appreciable variation from its specified dimensions or its true cylindrical shape. The cement pipe used shall be made of the best quality of hydraulic cement, subjected to such tests as may be required by the City Engineer, and at least thirty days old; the requirements, as far as dimensions and form, shall be the same as for the clay pipe. The straight pipe shall be straight in the direction of its natural axis, and its exterior and interior surfaces shall be concentric. All curves, slants or junctions shall conform to the foregoing requirements as regards quality, form and workmanship, and in general their thickness shall be equal to that of the pipe of the same calibre into which they shall be worked or jointed.

12. All mortar used in the construction of house drains or private sewers shall be composed of one part pure hydraulic cement, thoroughly incorporated with one part clean, sharp sand, mixed with clean water. It shall be used immediately after being mixed, and not allowed to stand after it has set; and then retempered. Whenever the use of grout may be

necessary, it shall be composed of pure cement powder and clean water, mixed to such a consistency as shall enable it to thoroughly permeate all parts of the work. All concrete shall be composed of one part pure cement powder, two parts clean, sharp sand, and four parts crushed stone and broken brick, or fine gravel. The mortar being made first, the stone and brick then added, the whole may be deposited in place, in layers not over six inches deep, and then the mixture tamped until the water flushes to the surface. The City Engineer shall have the right to test all hydraulic cement used, and any that he may reject shall be immediately removed from the work.

13. All work connected with the laying of drains to be done to the satisfaction of the City Engineer or his authorized inspector, and in no case shall the plumbing of the house be connected with the sewer unless a certificate is given by the inspector that the work has been properly done.

14. The drain-layer must give the inspector all necessary help in measuring up and locating the work.

15. Any workman who refuses to obey the orders of the inspector shall be immediately discharged, upon a written request of the City Engineer.

The contractor will be required to allow the Board of Water Commissioners and the Saint Paul Gas Company to put in such connections as may be ordered by the Board of Public Works, provided that the excavation for such connections shall be kept at least one block in advance of the grading.

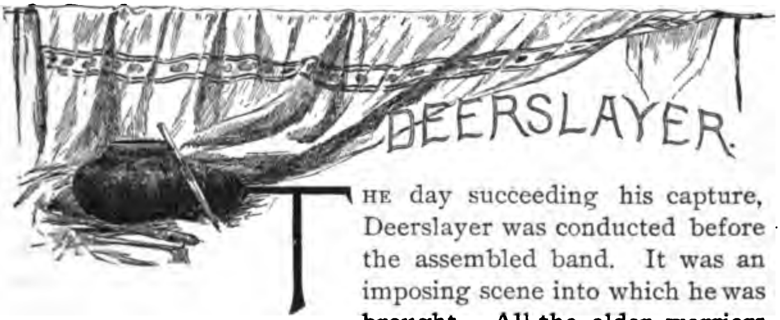
SCHEDULE OF PRICES.

For work not required by the plans or specifications, where specially ordered by the City Council to meet unforeseen obstacles, the following prices shall be paid:

For timber work forming part of permanent work only, including all nails and framing, per 1,000 feet, B. M.	$20.00
For rubble masonry laid in cement mortar, per cubic yard	5.00
For granite curb, per lineal foot, in place	1.00
For concrete, per cubic yard	5.00
For brick masonry laid in cement, per 1,000 brick	25.00

All estimates of brick work will be made at 15 brick per square foot of 8-inch wall.

A FAMOUS INDIAN STORY.*



THE day succeeding his capture, Deerslayer was conducted before the assembled band. It was an imposing scene into which he was brought. All the older warriors were seated on the trunk of a fallen tree, waiting his approach with grave decorum. On the right stood the young men, armed, while the left was occupied by the women and children. In the centre was an open space of considerable extent, always canopied by leaves, but from which the underbrush, dead wood and other obstacles had been carefully removed. The more open area had probably been much used by former parties, for this was the place where the appearance of a sward was the most decided. The arches of the woods, even at high noon, cast their sombre shadows on the spot, which the brilliant rays of the sun, that struggled through the leaves, contributed to mellow, and, if such an expression can be used, to illuminate. It was probably from a similar scene that the mind of man first got its idea of the effects of Gothic tracery and churchly hues; this temple of nature producing some such effect, so far as light and shadows were concerned, as the well known offspring of human invention.

As was not unusual among the tribes and wandering bands

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*This selection is from the famous *Leather Stocking* series of James Fenimore Cooper, who gives us in "Deerslayer" the most graphic and popular story of backwoods life in the English language. His hero, Natty Bumpo, passes through many adventures under the names of Deerslayer, Hawkeye, Pathfinder and Leather Stocking. His nearest companion is a chief of the Mohicans, or Delaware Indians, and is known as Chingachgook, or the "Big Serpent.' The latter's betrothed, a beautiful Indian girl, has been captured by the Iroquois or Mingos. The faithful Deerslayer aids his Indian friend in rescuing the girl from their enemies, but is himself taken prisoner. At this point our story begins.

of the aborigines, two chiefs shared, in nearly equal degrees, the principal and primitive authority that was wielded over these children of the forest. There were several who might claim the distinction of being chief men, but the two in question were so much superior to all the rest in influence that, when they agreed, no one disputed their mandates; and when they were divided, the band hesitated like men who had lost their governing principle of action. It was also in conformity with practice—perhaps we might add in conformity with nature—that one of the chiefs was indebted to his mind for his influence, whereas the other owed his distinction altogether to qualities that were physical. One was a senior, well known for eloquence in debate, wisdom in council, and prudence in measures, while his great competitor, if not his rival, was a brave, distinguished in war, notorious for ferocity, and remarkable, in the way of intellect, for nothing but the cunning and expedients of the warpath. The first was Rivenoak, while the last was called Le Panthere, in the language of the Canadas, or the Panther, to resort to the vernacular of the English colonies. The appellation of the fighting chief was supposed to indicate the qualities of the warrior, agreeably to a practice of the red man's nomenclature; ferocity, cunning and treachery being perhaps the distinctive features of his character.

"THE YOUNG MAN HAD ADVANCED INTO THE CENTRE OF THE AREA AND PROCLAIMED HIS PRESENCE WITH HIS VOICE."

Rivenoak and the Panther sat side by side, awaiting the approach of their prisoner, as Deerslayer put his moccasined foot on the strand; nor did either move, or utter a syllable, until the young man had advanced into the centre of the area and proclaimed his presence with his voice. This was done firmly, though in the simple manner that marked the character of the individual.

"Here I am, Mingos," he said, in the dialect of the Delawares, a language that most present understood; "here I am; do with me what you please. My business with man and 'arth is settled; nothing remains now but to meet the white man's God, accordin' to a white man's duties and gifts."

A murmur of approbation escaped even the women at this address, and for an instant there was a strong and pretty general desire to adopt into the tribe one who owned so brave a spirit. Still there were dissenters from this wish, among the principal of whom might be classed the Panther and his sister, le Sumach, so called from the number of her children, who was the widow of le Loup Cervier, now known to have fallen by the hand of the captive.

After much deliberation Deerslayer was offered his life on condition that he should join the tribe and become the husband of le Sumach. Deerslayer firmly refused to accept these terms. The whole tribe was offended, but the Panther was furious at this insult to his sister, and hurled his tomahawk at the captive. The latter, with singular skill, caught the weapon and hurled it back at his assailant, killing him on the spot.

"ABANDONING THE LIFELESS BODY WHERE IT LAY."

A common rush to his relief left the captive, for a single instant, quite without the crowd, and, willing to make one desperate effort for life, he bounded off with the activity of a deer. There was but a breathless instant, when the whole band, old and young, women and children, abandoning the lifeless body of the Panther where it lay, raised the yell of alarm and followed in pursuit.

Sudden as had been the event which induced Deerslayer to make this desperate trial of speed, his mind was not wholly unprepared for the fearful emergency. In the course of the past hour he had pondered well on the chances of such an experiment and had shrewdly calculated all the details of success and failure. At the first leap, therefore, his body was completely under the direction of an intelligence that turned all its efforts to the best account and prevented everything like hesitation or indecision at the important instant of the start. To this alone was he indebted for the first great advantage, that of getting through the line of sentinels unharmed. The manner in which this was done, though sufficiently simple, merits a description.

Although the shores of the point were not fringed with bushes, as was the case with most of the others on the lake, it was owing altogether to the circumstance that the spot had been so much used by hunters and fishermen. This fringe commenced on what might be termed the mainland, and was as dense as usual, extending in long lines both north and south. In the latter direction, then, Deerslayer held his way, and as the sentinels were a little without the commencement of this thicket, before the alarm was clearly communicated to them, the fugitive had gained its cover. To run amongst the bushes, however, was out of the question, and Deerslayer held his way for some forty or fifty yards in the water, which was barely knee-deep, offering as great an obstacle to the speed of his pursuers as it did to his own. As soon as a favorable spot presented, he darted through the line of bushes and issued into the open woods.

Several rifles were discharged at Deerslayer while in the water, and more followed as he came out into the comparative exposure of the clear forest. But the direction of his line of flight, which partially crossed that of the fire, the haste with which the weapons had been aimed, and the general confusion that prevailed in the camp, prevented any harm from being done. Bullets whistled past him, and many cut twigs from the branches at his side, but not one touched even his dress. The delay caused by these fruitless attempts was of great service to the fugitive, who had gained more than a hundred yards on even the leading men of the Hurons, ere something like concert and order had entered into the chase. To think of following with rifle in hand was out of the question, and after emptying their pieces in vague hopes of wounding their captive the best runners of the Indians threw them aside, calling out to the women and boys to recover and load them again as soon as possible.

Deerslayer knew too well the desperate nature of the struggle in which he was engaged to lose one of the precious moments. He also knew that his only hope was to run in a straight line, for as soon as he began to turn, or double, the greater number of his pursuers would put escape out of the question. He held his way, therefore, in a diagonal direction up the acclivity, which was neither very high nor very steep in this part of the mountain, but which was sufficiently toilsome for one contending for life to render it painfully oppressive. There, however, he slackened his speed, to recover breath, proceeding even at a quick walk or a slow trot along the more difficult parts of the way. The Hurons were whooping and leaping behind him, but this he disregarded, well knowing they must overcome the difficulties he had surmounted ere they could reach the elevation to which he had attained. The summit of the first hill was now quite near him, and he saw, by the formation of the land, that a deep glen intervened before the base of a second hill could be reached. Walking deliberately to the summit, he glanced eagerly about him, in every direction, in quest of a cover. None offered in the ground but a fallen tree lay near him, and desperate circumstances require desperate remedies. This tree lay in a line parallel to the glen, at the brow of the hill; to leap on it and then to force his person as close as possible under its lower side took but a moment. Previously to disappearing from his pursuers, however, Deerslayer stood on the height and gave a cry of triumph, as if exulting at the sight of the descent that lay before him. In the next instant he was stretched beneath the tree.

"DEERSLAYER GAVE A CRY OF TRIUMPH."

No sooner was this expedient adopted than the young man ascertained how desperate had been his own efforts by the violence of the pulsations in his frame. The footsteps of those who toiled up the opposite side of the acclivity were now audible, and presently voices and treads announced the arrival of the pursuers. The foremost shouted as they reached the height, then, fearful that their enemy would escape under favor of the descent, each leaped upon the fallen tree and plunged into the ravine, trusting to get a sight of the pursued ere he reached the bottom. In this manner Huron followed Huron, until Natty began to hope the whole had passed. Others succeeded, however, until quite forty had leaped over the tree, and then he counted them, as the surest mode of ascertaining how many could be behind. Presently all were in the bottom of the glen, quite a hundred feet below him, and some had even ascended part of the opposite hill, when it became evident an inquiry was making as to the direction he had taken. This was the critical moment, and one of nerves less steady, or of a training that had been neglected, would have seized it to rise and flee. Not so with Deerslayer. He still lay quiet, watching with zealous vigilance every movement below, and fast regaining his breath.

"THIS WAS THE CRITICAL MOMENT."

The Hurons now resembled a pack of hounds at fault. Little was said, but each man ran about, examining the dead leaves as the hound hunts for the lost scent. The great number of moccasins that had passed made the examination difficult, though the intoe of an Indian was easily to be distinguished from the freer and wider step of a white man. Believing that no more pursuers remained behind, and hoping to steal away unseen, Deerslayer suddenly threw himself over the tree and fell on the upper side. This achievement appeared to be effected successfully, and hope beat high in the bosom of the fugitive. Rising to his hands and feet, after a moment lost in listening to the sounds in the glen in order to ascertain if he had been seen, the young man next scrambled to the top of the hill, a distance of only ten yards, in the expectation of getting its brow between him and his pursuers, and himself so far under cover. Even this was effected, and he rose to his feet, walking swiftly but steadily along the summit in a direction opposite to that in which he had first fled. The nature of the calls in the glen, however, soon made him uneasy, and he sprang upon the summit again in order to reconnoitre. No sooner did he reach the height than he was seen and the chase renewed. As it was better footing on the level ground, Deerslayer now avoided the sidehill, holding his flight along the ridge, while the Hurons, judging from the general formation of the land, saw that the ridge would soon melt into the hollow, and kept to the latter as the easiest mode of heading the fugitive. A few, at the same time, turned south, with a view to prevent his escaping in that direction, while some crossed his trail toward the water in order to prevent his retreat by the lake, running southerly.

"LISTENING TO THE SOUNDS IN THE GLEN."

The situation of Deerslayer was now more critical than it ever had been. He was virtually surrounded on three sides, having the lake on the fourth. But he had pondered well on all the chances and took his measures with coolness, even while at the top of his speed. As is generally the case with the vigorous bordermen he could outrun any single Indian among his pursuers, who were principally formidable to him on account of their numbers and the advantages they possessed in position, and he would not have hesitated to break off in a straight line at any spot could he have got the whole band again fairly behind him. But no such chance did or, indeed, could now offer, and when he found that he was descending toward the glen, by the melting away of the ridge, he turned short, at right angles to his previous course, and went down the declivity with tremendous velocity, holding his way toward the shore. Some of his pursuers came panting up the hill, in direct chase, while most still kept on in the ravine, intending to head him at its termination.

(*To be continued.*)

WHAT BAD ROADS COST THE COUNTRY.

THE Board of Trade in a Tennessee town in a recent memorial to the legislature demonstrated that bad roads were costing the people of that commonwealth more than $7,000,000 annually. Prof. W. W. Carson, of the University of Tennessee, after careful investigation, found the average cost of hauling to the Knoxville market by wagon to be $7.50 per ton—aggregating $1,250,000 a year on the total tonnage hauled. He maintained that this hauling could have been done for half the sum over good dirt roads, and for one-sixth of it over good macadam roads, saving $1,000,000 annually. Prof. Richard T. Ely, of the Johns Hopkins University and Secretary of the American Economic Association, affirmed that poor roads cost this country over $20 a horse, and Prof. Jenks, of Knox College, Illinois, thinks $15 a horse a low estimate for the loss. Mr. Hord, a former commissioner of agriculture for the State of Tennessee, estimated the number of horses, mules and asses in that State in 1889 at 475,000. The number has increased since his estimate, but taking this number and the lowest estimated loss per horse, say $15, an aggregate loss of $7,140,000 a year for one State is shown. From papers calculated by Prof. Carson for an agricultural experiment station it is shown that on gravel a horse will draw one and a half times the load, and on macadam over three times the load he can draw on a dirt road. Of course there is great economy in drawing power in the proper grading of roads, and disregard of this fact has wasted large quantities of money in the road-building of the past. The greater speed made on scientifically graded and patent race-tracks illustrates the advantage of the grade.—*Albert Roberts, in the Engineering Magazine for July*

THE ROADS EXHIBIT AT THE WORLD'S COLUMBIAN EXPOSITION.

EVERY person who feels the need of improved roads within the United States, and who attends the great Chicago Exposition next year, will naturally direct his attention to that part of the exhibit which tends to illustrate, by machinery, methods and materials, the practical side of the road-maker's art. It is to be regretted that practical effect could not have been given to the admirable suggestion of Col. Pope that a combined and comprehensive exhibit should be made in this most important feature of the great Fair; but as such an event seems now improbable, we present here a brief guide by which our readers may be aided in finding those parts of the exhibit which bear, in one way or another, upon the subject of improved roads and streets. Locations of the separate buildings referred to in the text are accurately shown by the plan on the next page. Within each building the visitor will find the various "groups" and "classes" conspicuously marked and numbered.

DEPARTMENT A. AGRICULTURAL BUILDING.

"*Models of Fences; Construction of Roads; Literature and Statistics.*" Group 14: Class 79.

"*Ploughs and Rollers.*" Group 16: Class 84.

"*Stump Extractors.*" Class 88.

"*Traction Engines and Apparatus for Road Making and Excavating.*" Class 89.

"*Samples of Wood for Paving.*" Group 19: Class 99.

"*Timber Prepared in Various Ways to Resist Decay.*" Class 102.

"*Stump Pulling Devices.*" Class 117.

DEPARTMENT E. BUILDING OF MINES AND MINING.

"*Asphaltite and Asphaltic Compounds.*" Group 43: Class 293.

"*Building Stones, Granites for Bridges.*" Group 44: Class 296.

"*Artificial Stone Mixtures for Pavements.*" Group 47: Class 311.

"*Asphaltic Mastics and Mixtures.*" Class 312.

"*Rock Breakers.*" Group 64: Class 392.

"*Sizing Appliances.*" Group 65.

"*Sieves.*" Class 398.

"*Perforated Plates.*" Class 399.

DEPARTMENT F. MACHINERY BUILDING.

"*Street Rollers, Sweepers, and Sprinklers.*" Group 77: Class 488.

DEPARTMENT G. TRANSPORTATION BUILDING.

"*Systems of Drainage.*" Group 80: Class 499.

"*Wheelbarrows.*" Group 83: Class 509.

"*Carts.*" Class 510.

"*Sprinkling Carts.*" Class 511.

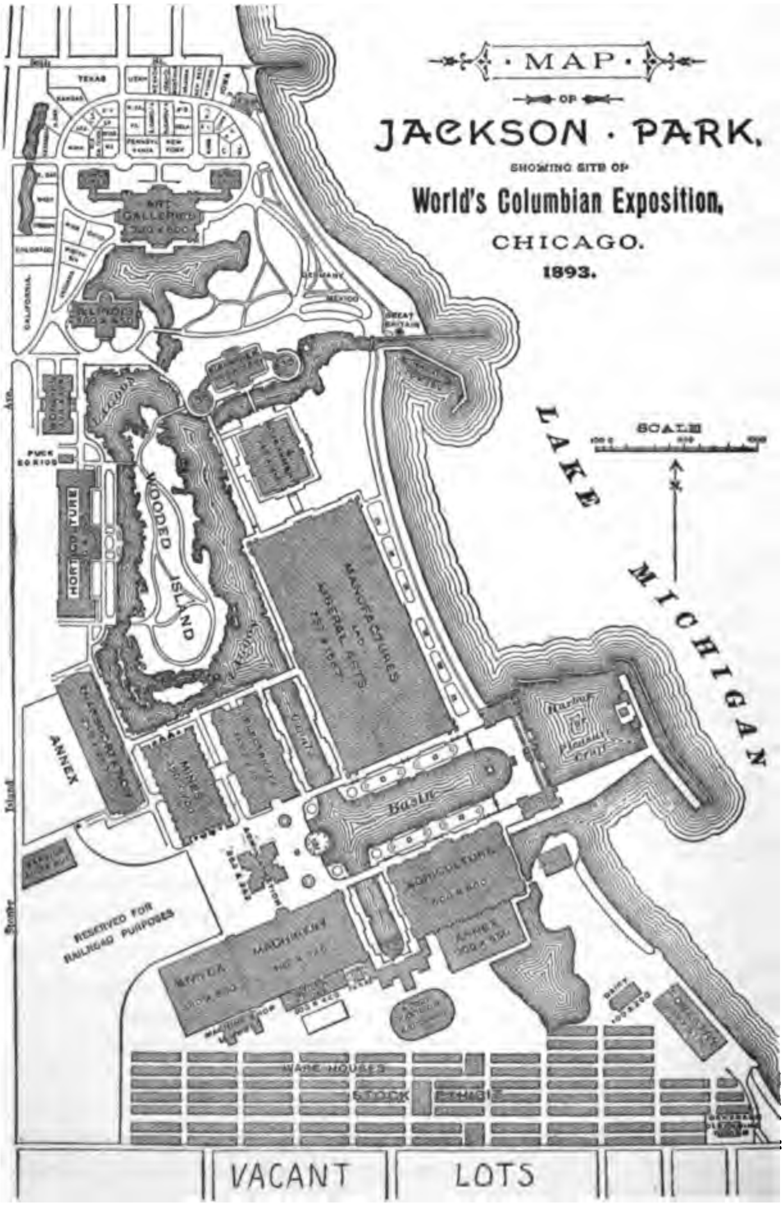
DEPARTMENT L. MANUFACTURES AND LIBERAL ARTS BUILDING.

"*Conduits of Water and Sewerage; Drains and Sewers.*" Group 147: Class 829.

"*Construction and Maintenance of Roads, Streets, and Pavements.*" Group 152: Class 879.

"*Bridges.*" Group 152: Class 880.

"*Working Plans for Paving and Draining.*" Class 889.



THE EDITORS TABLE

We want names and Post Office addresses (plainly written) of every civil engineer, supervisor, selectman, road commissioner chosen freeholder, contractor, city engineer surveyor and legislator in the United States. Kindly send all the names you can to GOOD ROADS, *Potter Building, New York.*

A FINAL WORD BEFORE ELECTION.—Be sure that the man who represents you in the next legislature of your state is in favor of better roads and a revision of the antiquated and inadequate road laws which now disgrace the statute books. The coming Winter will witness a vigorous effort, at several state capitols, for the passage of laws providing for the construction of improved roads in important and populous counties, and a little well directed and intelligent work at the November election will insure the removal of certain obstacles which might be encountered later in the legislative halls of your state. Your average legislator is not a statesman. There is likely to be a crudeness and shallowness about him that the imposing title of "Hon." will hardly obscure, and on all public questions where personal judgment and personal conscience should control his official action, he is apt to be found most glaringly astray. To him the chief end of a political career is to succeed at the polls, and once elected he makes himself comfortable in the stuffed seat of a legislative chair and lends an indifferent ear to every project that invites him to argument and action, unless he can be a hundred times assured that his political head depends upon the result.

But just now while he is full of eloquence and action, and while you find him racing about through the deep October mud, trying to stir the passive farmer with the profound but somewhat befogging assurance that the tariff is a tax, or *vice versa*, it will be easy to impress upon him the practical disadvantage of a bad road and the need of some substantial improvement. The country roads in many counties will offer dismal examples of this need within the next fortnight, and every worker for better laws and better roads should make the most of the situation.

THE Board of Supervisors of Queens County, N. Y., has just adopted by unanimous vote a local act regulating the width of tires upon wheeled vehicles used on the public highways of that county. The adoption of this ordinance marks an era of enlightenment in the Queens County district and supplies an example which should be widely emulated. It provides that after the 4th day of next July, it shall be unlawful to use upon the public highways of Queens County any wheeled vehicle weighing (with load) more than 4,000 pounds, unless the wheel tires shall be at least five inches in width. For a violation of this act each offender shall be fined, for the first offence, not less than $5, nor more than $15, and for each subsequent offence not less than $25 nor more than $50, or imprisonment in the county jail not exceeding thirty days. It is made the duty of each constable in the county to apprehend and arrest all offenders and to take them before the nearest justice of the peace. To encourage the enforcement of the law the sum of $2 collected from the amount paid by each offender is directed to be paid to the constable making the arrest in addition to the fees now allowed by law in criminal cases. The adoption of this law by unanimous vote of the supervisors at a meeting when all were present speaks volumes for the result of educational work in Queens County, and especially for the admirable zeal and enterprise with which Chairman F. W. Dunton has carried on the warfare for good roads during the last three years.

THE Republicans of Rhode Island have adopted, as a part of their state platform, a declaration in favor of good roads, thus manifesting a readiness to make the question of roads improvement a political issue. This timely action on the part of our Rhode

Island friends smacks of both sound statesmanship and practical politics. The first, because the material development of that state has been carried so well along in urban districts that, like some other states in this respect, the Rhode Island farmer has been socially shelved and the industrial progress of the state made to appear one sided and unsymmetrical; good roads, therefore, for the development of the farm and the farmer. The second, because, as is generally conceded, a substantial majority of the farmers of the Eastern states are Republicans, and as the condition of the country roads exert a powerful influence in determining the size of the country vote on election day, it may be counted a wise move for the party most interested to urge the improvement of these roads. In any event the feeling in favor of roads improvement in Rhode Island is waxing strong and before long much good will come of it.

A ROAD CONSTRUCTION COMPANY has just been incorporated at Albany, with a capital of $100,000. It proposes not only to construct roads approved by the most thorough methods, but to manufacture and sell crushers, rollers and other machinery belonging to the practical roadmaker's plant. It is a hopeful sign in the progress of roads improvement agitation that capital is being directed so largely to the pushing of the practical work.

As announced in our advertising pages, we shall soon begin the publication of state editions of GOOD ROADS. The intent of this scheme is to collect and print for a time, in each monthly number of the magazine, such matter as will strongly aid the movement in a particular state; it being clearly apparent that by this means each number will acquire a special and permanent value and will be largely in demand in the state to which this subject matter mostly refers. Our state editions will commence with the December issue, which will be known as the Illinois number, and, while its contents will be of good value and interest to all persons interested in the work, it will have special relation to conditions as they exist in Illinois, to the needs of that state in the field of improvement, and to plans and methods suggested for practical work and for the revision f the Illinois road laws.

A word here, in the way of suggestion. When you have read your December number of GOOD ROADS please consider the special value it will have to the Illinois reader and send it by mail to Chief Consul F. W. Gerould of that state. His address is 108 Madison Street, Chicago. You will in this manner contribute your aid to a good cause and with little sacrifice to yourself.

EVERY member of the League of American Wheelmen should read and know the constitution and by-laws of that body. The objects proclaimed, the duties prescribed and the benefits set forth should all be well understood as part of the mutual contract which binds together the largest organization ever founded for the purposes of physical recreation. The provisions of its organic law have been admirably conceived and arranged, and clearly expressed and the initial provision of the constitution, as set forth in Article 1, declares that the objects of the League shall be "to promote the general interest of cycling; * * to facilitate touring and to secure improvement in the condition of the public roads and the highways." It is fair to assume that every member of the League who receives and reads GOOD ROADS is familiar with the moral obligation imposed by his membership in the L. A. W. and that his active co-operation in spreading the good work may be at all times relied on. Indeed, if the hundreds of letters received at this office from League members may be counted on the side of assurance, GOOD ROADS has proved itself a needed medium through which much individual work has been accomplished and substantial results obtained beyond all expectation. The work of the wheelmen grows stronger, more influential and more prolific in results from month to month. They have gained the co-operation of horsemen, carriage makers, millers, merchants and even the farmers themselves; and by the splendid progress they have made in the face of prejudice and indifference, they have gained for the League a conceded title as the promoter and leader of the greatest public reform of the century. Let every wheelman, of whatever station or degree, lend a hand and voice to swell the volume of the work.

NEWS AND COMMENT

Read the announcement of State Editions of GOOD ROADS *in back advertising pages of this number. It is important that every reader should understand the scheme and co-operate with us in making it successful.*

PROFESSOR SHALER, of Harvard University, has contributed a most able and interesting article on the roads question to the *Atlantic Monthly*. It appears in the October issue of that excellent magazine.

A CORPORATION has just been formed in Arizona for the building and maintaining a driveway for light vehicles from the city of Phœnix north to the Arizona Canal, a distance of ten miles. The drive will be an extension of Center Street, 100 feet wide, the road proper occupying 80 feet, with 10-foot walks on either side the full distance. Shade trees will be planted at intervals of 16 feet. The land through which the road will run is now owned by individuals and will be donated for the purpose. Ditches of running water for irrigating the shade trees will line each side of the street. The stock of the corporation is limited to 2,500 shares of $10 each, and the use of the drive will be limited to stockholders and such other persons as may be specially permitted to use it. The material to be used in the construction of the road will be largely decomposed granite.

THE Philadelphia Director of Public Works has presented a communication to the mayor, and through him to the city council, recommending the ordinance regulating the width of wheel tires of omnibuses and other vehicles drawn by three or more horses on asphaltum paved streets, and requiring owners of these vehicles to pay to the city an annual license fee sufficient to maintain in good condition and repair the streets on which they run.

THE civil engineers of California have addressed an open letter to the citizens of San Francisco showing the miserable condition of the streets and sewers and calling attention to the wasteful and inadequate manner in which the money is expended. It appears that the average disbursements of money amounts to $1,700,000 and no substantial improvement is shown as an equivalent for this money. The letter of the engineers concludes as follows: "Party politics and party administration have alienated the administration of this office from the profession alone qualified to fully discharge its duties. Public sentiment should be so forcibly expressed that the political parties will be compelled to accede to this demand for reform."

"This circular has not been prepared in the interest of any candidate for office; it is intended to point out the means of improving the efficiency of one of the most important of the executive departments of this city's government."

THE Minnesota division of the L. A. W. at its last annual meeting appropriated the sum of $100 toward defraying the expenses of a state convention for better roads. Chief Consul Choate was appointed chairman of a committee to take charge of the preliminary work, and has begun his duties with most gratifying assurances of success. This committee has secured the approval and co-operation of prominent citizens in all parts of the state, and a December convention, to be held about the middle of that month, is now reasonably assured. Some of the leading citizens of the state will be present and deliver formal addresses; and the wide publicity already given to the announcement speaks with highest promise for the ultimate success of the convention. Chief Consul Choate makes no hesitation in giving the wheelmen their due prominence in organizing this convention. He says in plain words that the wheelmen have been for years paying the expenses and doing the work of pushing this reform, and that he is sick of the injustice which urges them to stand in the background while somebody else claims the credit. There is a power of good sense in Mr. Choate's position and we shall look with interest and confidence to the outcome of his enterprising work.

THE Canadian Wheelman's Association is about to inaugurate a vigorous movement for the improvement of the roads within the provinces, and a letter from Mr. Kingsley Evans, Chairman of the Roads Improvement Committee, informs us that the Canadian Association will aim to closely co-operate with the League of American Wheelmen in pushing this work.

"THE ROAD," an illustrated British magazine devoted to riding, driving and coaching, has just republished entire "The Gospel of Good Roads," and, by way of adding a feature of special interest to its English readers, has printed in prominent text under several of the pictures the titles "A Yankee Mud-hole," "A Yankee's Public Road," "Another view of a similar track," etc., etc. It is in no sense agreeable to feel that our English friends are justified in the mild ridicule which these expressions imply; but while we have abundant ability to help ourselves from the disgraceful conditions that surround us and yet neglect to do it, the criticism of intelligent foreigners must be borne and respected.

"IN five years' time," says Edgar L. Wakeman, "I have tramped along 3,000 miles of British roads. Each time I step my feet upon their broad, firm, even surface, every drop of American blood in me tingles with shame at the thought of the mud pikes and bottomless road sloughs of our own splendid country—rich, great and strong enough to match the roads of Europe without a week's delay. And yet for five months of every year, and in a lesser degree for the other seven, half of the people of our farming communities are imprisoned and impoverished helplessly at home. As one result, the people of the whole country pay, in an indirect road-tax, through annual sharp advances on all food necessities of life, all of which the farmers lose, a sum each year enormous enough to maintain as superb roads as England anywhere possesses, around every section of cultivable land in the entire United States."

AT the recent Democratic State Convention in Minnesota, the committee on resolutions received from Chief Consul Choate a copy of the following preambles and resolution for its consideration. The committee reported the resolution favorably without change and it was heartily indorsed by the convention, the last paragraph comprising the resolution being made a part of the state platform.

"*Whereas*, The cost of transportation of freight is a serious tax upon both the producer and the consumer, and

Whereas, The greater part of the freight carried over our water ways and railways must be twice transported over our common wagon roads before it reaches the consumer, and

Whereas, The common wagon roads of this state have not received their due share of attention, and by reason thereof are during a great part of the year an obstacle and a barrier to communication between the city and the country, often absolutely suspending all traffic between the farmer and his market at a time of year when the highest prices exist for his farm products, thus demoralizing business of all kinds and producing an annual stagnation, and notwithstanding the expenditure of large annual taxes thereon, are in most parts of the state little or no better than they were thirty years ago, and

Whereas, This state of affairs is costly, inconvenient and discreditable, and is largely due to the unsystematic methods used in the building and maintenance of country roads and the expenditure of road taxes in this state,

Resolved, That we are in favor of a radical change in the laws of this state and demand such legislation as will provide for intelligent and economical supervision of the building and maintenance of our country roads."

And so the good work seems to have taken hold in political quarters with sudden emphasis. A similar declaration coming from the Illinois Democratic Convention and another from the Rhode Island Republicans indicate that the political leaders have their wet fingers in the air and are beginning to understand which way the wind blows.

QUERIES AND ANSWERS

"BAXTER" (Toledo, Ohio).—Brick roadways are not of recent origin. The practice of laying a pavement of hard burned bricks was carried on many years ago in Holland, and good brick roadways are still to be found in that country. They are laid on edge, lengthwise at right angles with the direction of the road, and upon a solid foundation which has been prepared for that purpose.

"E. S. T." (Des Moines, Iowa).—A roadway having only four inches of macadam, without telford or other form of paved bottom, is not to be recommended, though such roadways are in use and are said to render excellent service. We regard six inches of macadam pavement, if laid on a firmly rolled earth bottom and made of good material properly put down, as ample for all the purposes of ordinary country traffic. The quality and durability of a macadam road depends much upon the quality of material used in its construction and the care with which it is constructed.

"NORRIS" (Minneapolis, Minn.)—Numerous methods have been adopted in the treatment of wooden blocks intended to be used in street pavements, among which might be mentioned, (1) the covering of their surface with a mixture of hot tar or "composition" and clean gravel; (2) the application of a chloride of zinc solution, which is absorbed by the wood in a close iron vessel from which the air has been exhausted; (3) saturating the wood with bi-chloride of mercury; (4) successive treatment by absorption of sulphate of iron and muriate of lime; (5) a simple application of coal tar, and (6) the forced absorption of impure pyrolignite of iron. It is not questioned that the durability of these blocks may be largely extended by chemical treatment. These methods of treatment have never become widely popular (except by simple application of hot tar or "composition" and gravel), owing to the large increase in cost involved. Wooden block pavements are almost noiseless, easy for horse and vehicle, pleasant to the traveler, and offers little resistance to the draft of vehicles. The chief objections to their use are their tendency to become slippery in wet weather and their liability to rapid decay. They are used in several of our western cities, where cedar blocks may be cheaply obtained, and in some cases are said to render good service.

"W.B.L." (Boston, Mass.)—The "gauge" of a railroad track is the width of the track measured between the inner sides of the rails at right angles with their direction. The gauge in common use is 4 feet, 8½ inches. It is not known to be based upon any scientific theory, and is sometimes called the "accidental gauge" by reason of the following facts: The tram roads on which common wagons and coal cars were used in England originally had a width of 4 feet, 8½ inches. When the experimental locomotives were first made in that country, it was obviously cheaper to build them to fit the rails of these tram roads. The first locomotive engine used in America was obtained from England and the American rails were laid to correspond with the gauge of the engine. Thus the practice went on of constructing railroads to fit the locomotive, and of building engines to fit the tracks already laid, till the railroads, cars and locomotives, all made to the "accidental gauge," have multiplied to their present proportions.

"OXFORD" (Plainfield, N. J.)—You are probably in error in supposing that the foundation stones of a telford roadway will sometimes "rise" and protrude through the macadam covering. This belief sometimes obtains in places where the macadam has been for a number of years neglected till it has worn down in weak spots and reveals the rugged edge of the telford foundation stones. An excellent way to test the wear of a road is to have a series of "bench marks" (permanent points, the elevations of which are determined and recorded by the engineer) located along the line of the roadway. This being done, the elevation of the roadway, as compared with the original height of its surface, can quickly be determined by means of the engineer's level, and this should be done at least two or three times in each year, and oftener when the amount of traffic is great. Unless this or similar means be employed, the wear of the road being gradual and moderately uniform can scarcely be detected bv the ordinary observer.

"E. B." (Hartford, Conn.)—Sir John Macneil was an Englishman who attained much repute by his practical investigation of the conditions required to move loads over ordinary roadways with the greatest economy of power. He instituted many experiments on different kinds of road, using carriages moving at different rates of speed, and in this manner obtained certain factors which have since been useful in computations relating to this subject. Among the important results in his work, he ascertained that the forces necessary to draw a load of one ton over different surfaces were as follows: On a well laid pavement, 31.2 pounds; on a pavement made with 6 inches of hard broken stone, laid on telford or concrete bottom, 44 pounds; on a flint road, or a road made with a thick covering of broken stone laid on earth (macadam), 62 pounds; on a road made with thick covering of gravel laid on earth, 140 pounds.

"HEISER" (Harrisburg, Pa.)—You can get the names and addresses of the road officers throughout your county by application at the office of your county clerk or at the offices of the town clerks of the several towns. In distributing the copies of your magazine as you propose, we would suggest that you send a brief note to each person, calling his attention to the importance of the work. We are receiving many thousands of names and addresses of town and county officers from L. A. W. members in various parts of the Union and to these officers we send sample copies of the magazine and other roads literature from time to time.

"WOOLETT" (Binghamton, N. Y.)—The "Richardson bill," we are informed, will be introduced into the New York Legislature early in the coming session and a vigorous effort made to insure its passage. Senator Richardson, its author and sponsor, is himself a farmer, and the bill is drawn largely in the interests of the farming communities. The proposed expenditure of ten millions of dollars for state roads is to be paid for by a state loan extending over seventeen years. The farmers would derive the greatest benefit from the provisions of this bill, while their share of the burden would be so small as to be scarcely felt. An examination of the last New York comptroller's report will reveal to you the fact that the farmers of New York state pay an exceedingly small proportion of the state taxes.

"B. C." (Syracuse, N. Y.)—President Sweet, of the New York State Roads Improvement Association, resides in your city and is prominently known in that and many other sections of the state. His full name is William A. Sweet.

"CRACK-A-JACK" (Newburg, N. Y.)—We cannot judge of the quality or kind of the stone from the meagre description contained in your letter. Send two or three small samples to this office and they will have careful examination.

"SEXTUS" (Indianapolis, Ind.)—Horse rollers are listed at about $100 per ton. We cannot answer as to discounts. Consult the catalogues of the various firms who advertise in our pages and correspond with them. They are all reliable.

CONTRACT NOTES

ROADS AND STREETS.

NEW YORK.—BUFFALO.—It has been judged best to pave all the streets of this city hereafter with vitrified brick, says the *Clay Record*.

BINGHAMTON.—State, Henry and Lewis Streets are to be paved with vitrified brick.

MT. VERNON.—This village has appropriated $22,000 for the proposed work of macadamizing the White Plains road.

NEW YORK.—Dean & Westerbrook, 136 Liberty Street, ask for proposals for 1,300 lineal feet of granite sidewalk flagging, six feet wide and eight inches thick. For further particulars apply at the above office.

Two streets are to be paved with asphalt on concrete and granite blocks, and bids will be received by the Commissioner of Public Works.

ALBANY.—Surveys and estimates have been completed by the City Engineer for the new northern boulevard, at an estimated cost of $35,000. The length of the boulevard is to be about 8,000 feet.

ELMIRA.—Two streets are to be paved with vitrified brick, by vote of the Common Council, and bids will be asked for in a short time.

MISSOURI.—KANSAS CITY.—Work will be readvertised for paving several streets and alleys with brick, as the former bids have been rejected.

ST. JOSEPH.—Vitrified brick will be used to pave Isadore Street from Tenth to Eighteenth Street.

WISCONSIN.—WEST SUPERIOR.—North Twenty-sixth and West First Streets are to be paved with vitrified brick.

NEBRASKA.—OMAHA.—Ten additional streets are to be paved with vitrified brick.

Bids will be received by the Board of Public Works until October 14 for constructing a curb in one of the streets; also for paving with granite, sandstone, brick or asphalt.

LINCOLN.—Vitrified brick is to be used extensively for the paving of three more sections of paving districts.

TENNESSEE.—MEMPHIS.—Brick paving will be begun on Union Street from Main to Front Street.

OHIO.—TOLEDO.—Brick paving will be done in Wisconsin Street.

Five streets are to be paved with Medina sandstone, vitrified brick, Trinidad Lake asphalt, or cedar blocks. Bids will be received until October 17 by the City Clerk.

CINCINNATI.—Proposals will be received until October 13 by A. Butterfield for the work of paving Pecan Street with vitrified brick.

Granite blocks are be laid on one street and bids will be received by the Board of Administration until October 6; also for paving one street with brick, for which the City Auditor will receive bids for $55,000 of four per cent. bonds.

The work of improvement on Eighth Street, in connection with the viaduct, will include paving, curbing and filling, and bids will be received until October 11 by the Board of Administration.

FREMONT.—Bids will be opened October 17 for the paving of Main Street with vitrified brick, the work to be begun shortly afterwards.

XENIA.—It has been decided by the City Council to pave the principal streets with brick, and that the property owners bear the expense, the same to be paid for within the next fifteen years. The work will be commenced in a short time after the bonds have been issued.

DAYTON.—Paving with stone flagging, asphalt or cement is to be done here in seven streets, for which the City Comptroller will receive bids.

FINDLAY.—Ely Street is to be improved. J. S. Humphrey, City Engineer, will receive bids until October 21, and any further information may be obtained from him.

NEWARK.—Granville Street is to be paved with brick, and bids are advertised for by the City Clerk.

ASHLAND.—Brick pavement will be laid here in Orange Street.

CHAGRIN FALLS.—The decision of the City Council, at a recent meeting, was to improve several of the streets with crushed rock.

ATTICA.—The work of macadamizing the road leading to this town will probably be begun soon by the Commissioners of Seneca County, and three rows of tile will be laid under the road, one on each side and one through the centre. This is thought to afford perfect drainage.

COLORADO.—DENVER.—Sidewalk and other improvements are to be begun, and the Board of Public Works will receive bids until October 18.

IOWA.—LYONS.—It is agitated to have some paving done in this city before very long. Further particulars will be given later.

HAMPTON.—Street paving is to be begun in this city some time during the present year, and bids for the work will probably be received.

DES MOINES.—Paving with brick on concrete foundations will be commenced here shortly.

VIRGINIA.—LYNCHBURG.—Paving will be commenced in two squares of Church Street. Bids will probably be asked for at an early day.

PENNSYLVANIA.—AMBLER.—Lindenwold Avenue is to be macadamized shortly, by vote of the Town Council.

WILKINSBURG.—Street improvements are to be made here, and the citizens have voted to issue bonds for $55,000.

WILMERDING.—Several streets are to be paved, for which bonds will be issued.

ALLEGHANY.—It is proposed to submit to the citizens of this town an ordinance advising them of the desirability of issuing bonds to the amount of $2,000,000, for various improvements, among them being $600,000 for streets. The question will be discussed and bids will probably be asked for the work at an early date.

ILLINOIS.—Chicago.—Nearly two hundred streets and alleys are to be paved here, and the Commissioner of Public Works will advertise for bids.

Trinidad asphalt is to be laid on the Washington Boulevard from Halsted Street to Western Avenue.

Danville.—William Street is to be paved, for which bids will be received by the City Engineer until October 26.

TEXAS.—Houston.—Vitrified brick street paving is to be done on an extensive scale here, and grading has been begun preparatory for the paving.

INDIANA.—Indianapolis.—North Alabama Street is to be paved by the Western Paving and Supply Company, between Tenth and Fourteenth Streets.

Seven contracts are to be let in this city, which include the pavement of two streets with brick. The Board of Public Works will receive bids for the work. The City Engineer is also preparing specifications, estimates, etc., for paving a couple of streets with asphalt, and one each with granite blocks and brick.

Logansport.—Bids for the improvement of the unfinished part of Spencer Street will be received by the City Clerk until October 18.

SEWERS.

NEW HAMPSHIRE.—Concord.—A sum not exceeding $20,000 has been voted by the City Council for sewer extensions.

Littleton.—It is proposed to extend the work of the sewerage system next year according to plans, etc., now being prepared. Geo. H. Allen, of Manchester, is at present at work on plans and estimates for a sewerage system in this town.

VERMONT.—Montpelier.—A public meeting will soon be held for the purpose of discussing the sewerage system, a report for which has been prepared by an engineer of this town.

MASSACHUSETTS.—Winthrop.—It has been voted by the Town Council to construct sewers at a cost of $13,000 at Winthrop Highlands. Bids will probably be asked for at an early day.

Waltham.—$15,000 have been appropriated by the Board of Aldermen for sewer extensions.

PENNSYLVANIA.—Philadelphia.—Bids are being received by the Board of Public Works for bridges and main sewer inlets, etc., including main sewer in Shunk Street and Passayunk Avenue.

Wilmerding.—Bonds for $75,000 have been voted by the citizens for sewers and street improvements.

Scranton.—It is under consideration to build a system of sewers, and the City Engineer has prepared plans for one estimated to cost about $77,000.

LOUISIANA.—New Orleans.—A company was organized here in September, with Dr. Joseph Holt as president, for the purpose of acquiring the franchise granted by the city to A. A. Woods, and of constructing and operating the sewerage system therein provided for. Preparations have been made and plans and specifications will shortly be submitted for the work of a complete system of new sewers.

NORTH DAKOTA.—Fargo.—Bids for a system of sewers are to be advertised for by the City Auditor. The proposed length of the sewer is one mile.

MISSOURI.—Kansas City.—Arrangements are being completed by special committees from this city for the construction of a sewer to drain the west bottoms, the estimated cost of which will be about $16,000.

Mexico.—A new system of sewers has been decided to be built, the mains of which will be twenty-one inches in diameter. Work of construction is proposed to be begun at once.

WASHINGTON.—Montesano.—Bonds for $15,000 have been voted to be issued by the citizens for a complete system of sewers.

CALIFORNIA.—Oakland.—The proposed five-foot sewer in Second Avenue is estimated by the City Engineer to cost $45,400. The length of the sewer is 2,278 feet.

Los Gatos.—Six and eight-inch vitrified pipe sewers are to be constructed in several streets, as reported by the special committee organized to look into the work.

Monica.—Maps for the proposed sewer lines for this city have been ordered to be prepared by C. W. Zacharias, Engineer. The estimated cost of the work is between $300,000 and $400,000.

NEW YORK.—New Paltz.—A Board of Sewer Commissioners has been lately appointed, and the citizens have decided that a system of sewers should be constructed.

Troy.—It has been ordered to build several new sewers.

Bids are being received for a pipe sewer to be laid in Sixth Avenue.

Twelve sewers are proposed to be constructed, including two brick sewers, by resolution of the Council.

Batavia.—Surveys, estimates and specifications are to be made by J. W. Holmes for a sewerage system, and it is proposed to issue bonds for $300,000.

Hornellsville.—Work on the new sewer will be readvertised, as the present undertakings have been discontinued. The contract for the former work was awarded to Miller & McDougal at about $87,000.

Lansingburg.—Bids will be received by the Board of Water Commissioners for two twelve-inch vitrified pipe sewers.

Oswego.—Upwards of $100,000 will be spent in this city for sewers this Fall.

Rochester.—Proposals have been issued for a number of sewers to be completed this year; the city will also put in about ten miles of sewers this month.

Cohoes.—Bids will be received on October 19 by the Council for a 12 and 18-inch sewer in one of the streets.

Flushing.—A sewer is to be constructed in Myrtle Avenue, the estimated cost of which is about $25,000. It has been under consideration for some time and was finally decided by the vote of the Village Trustees.

FORT PLAIN.—Plans, estimates, etc., are being prepared for a system of sewers, the estimated cost of which will be less than $25,000. D. C. Smith, Schenectady, Engineer.

NIAGARA FALLS.—A trunk sewer, consisting of an 8-foot tunnel about 5,000 feet long and 45 feet below the surface, is to be built, and bids will be asked for until October 28 for the work.

SARANAC LAKE.—Bonds for the sum of $7,000 for a system of sewerage were voted to be issued at a recent meeting of the citizens.

BUFFALO.—Bids will be received by the Board of Public Works until October 19 for 10 to 18-inch tile, and 30 to 36-inch brick sewers.

KENTUCKY.—NEWPORT.—Plans, specifications and all further information may be had of B. R. Morton, City Engineer, in regard to the new sewerage system to be built here in a short time.

NEW JERSEY.—JERSEY CITY.—Bids will be received by the Board of Street Commissioners for 300 lineal feet of forty-eight-inch brick sewer, with manholes, etc.

LINDEN.—Steps are being taken by the Township Committee to insure a system of sewers for the township.

MONTCLAIR.—Bids will shortly be advertised for a system of sewers. The Township Committee have the work under consideration.

PATERSON.—It has been decided by the Board of Public Works to construct sewers in eight streets. The work includes 2,700 feet of 24 to 36-inch brick sewers.

VIRGINIA.—MANCHESTER.—It is under consideration of the City Council to grant a franchise to John C. Robertson and others, for the construction of a system of sewers in the city.

Bids will soon be asked for by the Street Committee for a sewerage system.

MINNESOTA.—MINNEAPOLIS.—Sewers are to be laid in forty-four streets, for which Andrew Rinker, City Engineer, has prepared plans and estimates.

IOWA.—DES MOINES.—Bids will be received by the Board of Public Works for five twelve to eighteen-inch pipe sewers; also a forty-eight-inch double-ring brick sewer to be laid in East First Street.

NEBRASKA.—OMAHA.—At the November election, it is proposed to vote upon the advisability of issuing $100,000 sewer bonds.

TEXAS.—DENISON.—Mr. McWillie, City Engineer, is preparing plans and surveys for sewer extensions, estimated to cost about $11,000.

GAINESVILLE.—1,500 feet of twenty-inch pipe sewer is to be constructed, by order of the Council.

LAREDO.—It is proposed to build a sewerage system. Estimates as to the probable cost are being prepared by C. Delafield, of New York.

ILLINOIS.—LOMBARD.—Messrs. Prout, Burnham & Russell, of Wheaton, have prepared plans for the proposed sewerage system, the estimated cost of which is about $20,000.

NORWOOD PARK.—Bids will be received by the City Clerk until October 13, for twelve-inch vitrified brick sewers.

WHEATON.—Messrs. Prout, Burnham & Russell are preparing plans and estimates for a sewerage system.

BELLEVILLE.—Mr. Wickenham, of Toledo, O., has completed plans for the building of a system of sewers in this place.

OHIO.—LIMA.—It has been voted by the City Council to ask the next legislature to authorize the city to issue bonds to the value of $50,000 for sewers.

NEWARK.—A tile sewer is to be laid in Buena Vista Street, for which the City Clerk will receive bids until October 10.

CLEVELAND.—Bids will be received until October 12, for a sewer in Detroit Street, with an outlet to the Cuyahoga River. Bids will be received by the Board of Control.

Five per cent. sewer bonds for $16,000 will be received by the City Auditor of this city.

MARIETTA.—John W. Hill, of Cincinnati, has submitted plans and profiles for a general system of sewers in this city.

ZENIA.—It is contemplated that a new sewerage system will shortly be begun here. Bids will probably be asked for at an early date.

YOUNGSTOWN.—Until October 21 bids will be received by the City Clerk for a sewer in one of the districts.

FINDLAY.—Sewers are to be constructed in District No. 2, for which bonds will be issued to the amount of $60,000.

INDIANA.—HUNTINGTON.—Until October 24, bids will be received by H. H. Wagner, City Engineer, for the Flint Creek sewer and drain.

TERRA HAUTE.—A sewer is to be constructed in this city, for which bids are asked by the City Clerk.

FORT WAYNE.—Bids will be received until October 25 for 2.3 miles of four to six feet double ring brick sewer.

UNION CITY.—Until October 24 bids will be received by the City Clerk for a sewer in Clifford Avenue.

MICHIGAN.—BAY CITY.—It has been voted by the City Council to build a sewer 26 x 39 inches in Eighteenth Street to the river, a rough estimate of the cost of which is $10,000.

ISHPEMING.—Bids for the trunk sewer will be advertised for by the Sewerage Committee, and it has been decided to employ a suitable and competent man to superintend the work of construction.

MUSKEGON.—Plans, etc., for a system of sewers have been prepared at an estimated cost of about $10,000, and it is expected that the work on the main sewer will be begun this Fall.

NEGAUNEE.—Bids will be advertised shortly for a ten to twenty-two-inch tile for the trunk sewer, by the Committee on Sewers. Plans and specifications are to be prepared at once.

TENNESSEE.—NASHVILLE.—The City Council has appropriated $22,500 for the construction of the Lick Branch outlet sewer, from Front Street to the river.

CHATTANOOGA.—The work of constructing several sewers to cost about $9,000 will be advertised by the Board of Public Works.

MAINE.—WESTBORO.—The City Council has directed the City Engineer to prepare plans, etc., for a complete sewerage system.

OREGON.—CORVALLIS.—It is proposed to build a new sewerage system to cost about $50,000. Plans, etc., are being prepared.

BORROWED WIT

ONLY ONE FAULT.

She can fix her hair in fashion, and her manner's rather dashing, and her dainty little shoes are just in style;
She can jabber French and German, and expound upon a sermon, and set a person crazy with her smile.
In the tastes that are æsthetic, and in mixing face cosmetic, they say she has no equal anywhere,
And in chewing tutti frutti she enhances much her beauty, and the settings in her teeth are very rare.
She can thump a grand piano, and can sing in great crescendo, and her style of elocution's very trim;
She has college education, is the pride of her relation, but she still persists in saying "It is him."

HOW HE GOT "UP HEAD."

Excellence is, after all, a matter of comparison. A boy of six years, who attends a private school, where prizes are given on all sorts of provocation, but who, as yet, had never earned a prize, came home one afternoon and exhibited proudly one of these rewards of merit. "Good," said his mother, 'but how did you get it?" "I was first in natural history," said the boy. "Natural history, at your age! How did it happen?' "Oh, they asked me how many legs a horse had." "And what did you say?" "I said five." "But a horse hasn't five legs, child!" "I know it, but all the other fellows said six."—*Philadelphia Record.*

TRIALS OF HIGH LIFE.

First Guest.—Awful bore, isn t it?

Second Guest.—Dull as a funeral. I knew it would be.

First Guest.—You knew it? Then why did you come?

Second Guest.—Had to. My wife heard that the formula for writing regrets had changed, and she couldn't find out what the new style was. So she sent an acceptance. —*New York Weekly.*

REVENGE IS SWEET.

St. Peter.—A man who used to write jokes about me for the New York papers came up to-day.

Michael.—What did you do to him?

St. Peter.—I first sent him down by the toboggan. Then I had him brought back and sent him down by the elevator; brought him back again and told him to "slide." I used all the methods he used to credit me with.—*Town Topics.*

IT COULDN'T FAIL.

His history is briefly told. After several days of thought he discovered a sure way of making money, and, like other men, he was in a hurry to try.

He made haste to insert an advertisement something like the following in several country weeklies:

"Sure way to kill potato bugs; send twenty 2-cent stamps to X. Y. Z.,——, for a recipe that cannot fail."

Then he hired a dray to bring his mail from the post-office and had 10,000 of his recipes printed. Inside of two weeks something like 6,000 or 7,000 farmers had contributed twenty 2-cent stamps each for the printed recipe.

Then several hundred of them bought clubs and railroad tickets and started out to interview the advertiser. At his office they were informed that he had left to attend to some business in Europe, and he was not expected back. All he had left was a package of 3,000 or 4,000 slips of paper, on which was printed the following:

"Put your bug on a shingle. Then hit it with another shingle."—*Chicago Daily Tribune.*

F. A. DUNHAM, Civil Engineer
AND EXPERT IN ROAD AND STREET IMPROVEMENTS.
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VOL. 2. NOVEMBER, 1892. NO. 5.

An illustrated monthly magazine devoted to the improvement of the public roads and streets

"A want of understanding and system has resulted in a nearly useless expenditure of enough labor and money to have furnished the settled portions of our country with good, substantial roads."

President Harrison.

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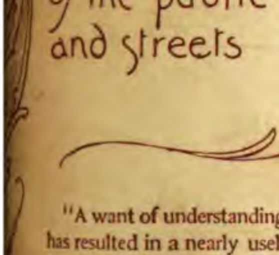

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GOOD ROADS.

Vol. 2. November, 1892. No. 5.

AN URGENT WORD FROM MAINE.

By Hon. Joseph H. Manley.

The common roads of the country are the one result of governmental creation, in which every citizen and every person has a common interest. Next nearest to the people, for the purpose of everyday use, comes the postal system; but while thousands of our inhabitants in every state have little use for the postal system, since they neither receive nor send communications by the medium it provides, yet these persons, as well as the lame, the halt, the blind and indeed all members of the human family must pass over the common road if only to reach that last long home that must eventually receive their mortal bodies. Why, then, should not Americans have the best roads that can be built?

HON. J. H. MANLEY.

It is a lamentable fact that the common highways of the United States are vastly inferior to those of nearly every other country in the world. The radical cause of our poor highways lies in the fact that in nearly all the states, what is termed road legislation, is based upon road tax; that is, in the rural districts, the tax-payer works out his taxes by labor performed upon the highways; and good roads can never be built by this system.

The great Commoner of England, Mr. Gladstone, uttered a profound truth when he declared that "the duties of a government are parental." The several states should, by competent legislation, inaugurate a state system of caring for, repairing and rebuilding its common roads.

The true economy of a hard roadway surface is recognized in every community where heavy and constant traffic make these roadways at first appear a necessity, and no city of any considerable size can be found to-day without a substantial exhibit of paved streets and smooth, hard roadways.

We cannot have paved roads for our common highways, but we can have good roads, and throughout New England, in most instances, we can have macadamized roads.

The common highways are the arteries of agricultural and commercial life. Over the public highway every citizen must travel to deposit his ballot and exercise his highest privilege as a citizen; and it is the duty of the state to see to it that the roads thus used are made as near perfect as possible. No child receives his education unless he travels to and from the district school, the academy, the city high school, the college or university, over the common roads of his locality. Does not, then, the educational system of our country demand perfect roads? A great steamboat line along the water highways of the country, the grand trunk lines of railways which traverse every state, bring increased prosperity, wealth and higher civilization.

"OVER THE PUBLIC HIGHWAY EVERY CITIZEN MUST TRAVEL TO DEPOSIT HIS BALLOT."

What, then, would be the effect, if the common roads of our land over which every person has to travel, and by which every person receives his mail, and all the necessaries of life, and the comforts of home, were made perfect? We should always strive to obtain the best; we should never be satisfied with anything that is inferior.

Those who, in Maine, are called the "plain people," are deeply interested in this question. It is, to-day, one of vital importance, and the subject should never be left, at least until we have perfect roads.

HOW TO KEEP WAGON TIRES TIGHT.

Wagon tires get loose in very dry, hot weather from two causes, the chief of which is the shrinkage of the wood of the felloes. It is a poor plan to wet the felloes and thus swell the wood, for it will very soon dry out and leave the tires as loose as ever. If, however, the wood be soaked in boiling linseed oil it will be swelled and the tires tightened as permanently as though cut or upset by a blacksmith. A writer in the Ohio *Farmer* gives the following instructions for doing this: "Make a trough a little wider and a little deeper than the felloes of the wheel. Heat linseed oil to the boiling point, and at this temperature pour in the trough. Have everything so arranged that you can immediately turn the wheel slowly through this boiling oil. Two or three revolutions are sufficient. Then take the next wheel. One heating is sufficient for four wheels, if the work is rapidly done. Better, however, add a little boiling oil after the second wheel is soaked. Have sufficient oil in the trough to cover the felloes. After the wheels are all attended to the oil may be poured into a vessel and kept till the next occasion. The skeptic of course says it will do no good. The oil cannot contract the tire. It is immaterial whether the oil contracts the tire or expands the wood. We do know that it makes a perfect job. On one occasion it so firmly tightened the tire that the spokes began to bend. This process of tightening tires is far preferable to that of the blacksmith. The wheel retains its original shape better. If wagon wheels are so treated once a year they are able to endure the hot and dry season. The whole cost will be a few cents' worth of oil to the wheel and a few minutes' work."—*Kansas Farmer.*

THE ROADS OF ANCIENT AMERICA.

By Edward W. Perry, President of the Honduras Company.

IF it be true that "the road is that physical sign by which you will understand any age or people; if they have no roads they are savages, for the road is the creation of man and a type of civilized society," what must we think of the peoples who inhabited the real America—that Amaru-ca or land of *men*, where, four hundred years ago, the Spanish invader found magnificent systems of roads that were already very old. They surpassed the best achievements of Roman art in road making, and stand the greatest and best highways ever seen. Humboldt declared that they were "the most useful and stupendous works ever executed by man." They stretched across broad plains and ran through valleys; were carried on immense masses of solid masonry through morasses; crossed rivers on grand arches of stone or on suspension bridges; climbed the sides of tremendous precipices, and went through tunnels cut in the solid rocks. They led up over mountain tops in the regions of eternal snows, fourteen thousand feet above the level of the ocean. Their smoothly macadamized surfaces, forty feet wide, were in many places supported by masonry that is to this day the wonder and delight of intelligent observers. Beside these roads were stations, five miles apart, for the shelter of the couriers who carried dispatches a the rate of a hundred and fifty miles a day. The longer of these roads is fifteen hundred miles in length. There were three such highways in Peru, six in Bolivia, and eight in Chili.

EDWARD W. PERRY.

As was natural, the countries which had such roads were exceedingly rich and powerful. They were much given to the pleasing occupation of extending their domains. Often this was done by peaceable means; sometimes by more Christian-like measures, when diplomacy and persuasion had failed. Agriculture and the arts prospered. The storehouses held treasures of jewels, gold and silver so vast that the civilized world was astounded by the richness of the booty stolen from the Americans by treacherous robbers and assassins, whom the world still honors for having discovered the western world, and destroyed its civilization.

Wherever the finger of Spain touched, blight followed. Progress was impossible under her rule. The people of ancient America have not yet fully recovered from the ruinous effects of three centuries of cruel, atrocious oppression to which they were subjected by their white conquerors. They were despoiled of all that men most prize, and received little of value in return. But they recovered from that overwhelming disaster more quickly and completely than did any other people who suffered from Spanish misrule, and are making far better use of the great natural wealth at their command, and are living on a much higher plane than are any other American races who, having a climate of unsurpassed beauty, lands of exceeding fruitfulness, forests abounding in precious woods and mountains hiding rich stores of silver, gold and jewels, have not good public highways.

In the greater part of Latin America the value of agricultural and other productions is greatly diminished, and the cost of living is correspondingly increased by the lack of good roads. To what extent this is true even those most directly concerned do not seem to clearly realize. In most of the countries south of the United States nearly all freight is carried on the backs of mules or other pack-animals. In one country which I have especially in mind the actual cost of transportation over a distance of between 150 and 200 miles is seven to eight cents per pound, or $140 to $150 per ton. This in the dry season, when the trails are in comparatively good condition; in the wet season the roads are often as impassable as those of our prairie states are in Spring. To the cost of carriage mentioned there is to be added that which comes from delays, and from damage to goods, often ranging from 50 to 100 per cent. of the value of the goods.

Imagine the effect upon agriculture of a burden like that

In the interior are delightfully cool, sunny, healthful valleys, and breezy, elevated mesas where the farmer grows corn, rice, coffee and sugar cane at small cost, for his cane produces continuously year after year without replanting; his maize and rice will yield two and even three crops a year; his cattle never need feeding, and there are no inclement winters in which he must be idle. But of what use is it to grow more of these things than the home market requires, if to the cost of production by hand labor and crude implements, seven to eight cents per pound at least must be added for the mere cost of carrying to market at the seaside, where the products must compete with like articles obtained and moved at small cost, by means of improved methods and machinery. It is easy to see why the planter in the interior thinks that, as the governor of the department of Olancho once said to me when discussing this subject, "It is better to do nothing for nothing than to work hard for nothing."

With a system of good roads, tropical America might be made to supply the world with abundant food, far more easily than the so-called temperate zones can do it. Yet many of those countries import considerable quantities of food. The riches of their forests are almost untouched, and few of their many valuable mineral deposits are worked at a profit. Their mines are rich, but the cost of carrying machinery to them, and of taking away the ores, concentrates and bullion, added to the cost of mining, leaves little or no profit. The result is that land is almost without selling value, and many a man who owns thousands of broad acres and veins of silver or of gold of surpassing richness, lives in a hut of adobe, sleeps on a bull's hide stretched as tight as a drumhead and as hard as iron, and shivers all night under a single cotton sheet. His family dresses in the cheapest of garments, and but few of them. His wife and daughters go about barefooted on the dirt floor, and are often unkempt, untidy and altogether unlovely. They lack those communications which tend to make good manners in any community. His land is unsalable, nor can he find a buyer for his mines; the fine timber in his forests is practically worthless to him, although it would make him wealthier than his wildest dreams have ever pictured him, if it could be put into the great marts. His children grow up ignorant, indolent and hopeless, to live and die in worse condition than their forefathers were in four hundred years ago.

And such is the life of people in many parts of these United States, where we brag loudly of our high civilization. Within ten miles of pretentious towns are huts wherein the dwellers live in a squalid misery more degrading than that of inhabitants of Central and South America. Is it because with all our boasted advancement "the present condition of our ordinary lines of communication is a disgrace to our civilization?" Is it mainly because "the common roads of the United States have been neglected, and are inferior to those of any other civilized country in the world," as they are certainly immeasurably inferior to the great roadways that existed in America, long before people of our boasted and false civilization first put foot on this continent?

WHAT GOOD ROADS MEAN.

THEY would make it possible for the farmers to take advantage promptly of the highest market, no matter at what season of the year.

They would save him days and weeks of time which he wastes every year wallowing through the disgusting mire of dirt roads.

They would reduce to a minimum the wear and tear on wagons and carriages.

They would lessen the expense in keeping horses in working order, and fewer horses would be required in the country to perform the farmer's work.

They would require less to keep them in repair than do the dirt roads.

They would make it easier for a team to pull several tons over their smooth surface than to draw a wagon through the mud.

They would afford ready communication with the outside world at all seasons of the year.

They would save the farmer many vexations and nervous strains.

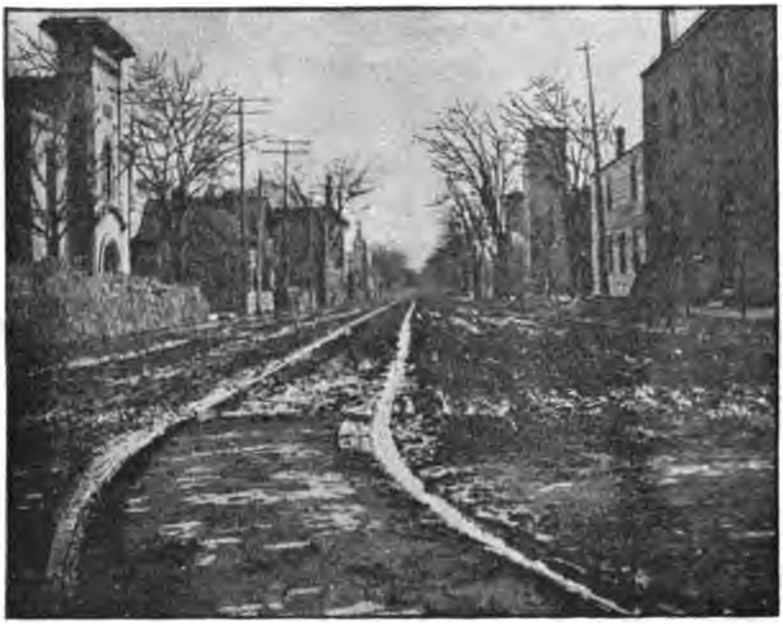
They would practically shorten the distance to the local market.

They would increase the demand for country and suburban property.—*Farm and Fireside.*

STREET IMPROVEMENT IN DUNKIRK, N. Y.

By Geo. E. Blackham, M. D.

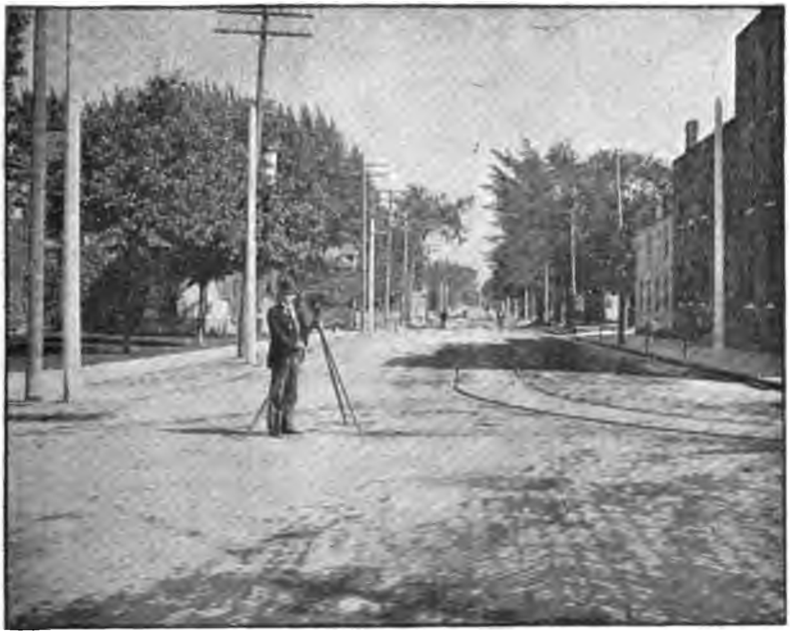
THE city of Dunkirk is situated on the south shore of Lake Erie in the extreme western corner of the State of New York. Its soil is chiefly a plastic clay, impervious to water and about the best material for making mud that could be devised. Until within the past three years the streets of the city have been made of this mud by simply rounding and grading the surface and the result has been that our streets have been like the famous little girl who



VIEW OF EAST FOURTH STREET, DUNKIRK, DURING RAINY SEASON AND BEFORE IMPROVEMENT.

"When she was good, was very good indeed,
But when she was bad she was horrid."

In dry weather, after the surface had time to dry and to wear smooth, the streets were as smooth and as hard as could be desired, but with a day or two of rain came a change. The clay would not allow the water to soak in, and so it lay on the surface in any little depressions, and the passing vehicles soon worked it into an adhesive paste that was simply dreadful to contemplate and still worse to attempt to pass through. In the Fall and Spring the mud would be hub-deep on our most used streets, and our really thriving and enterprising city got a very bad name, "Mudkirk," that did much to keep people from coming here and thus retarded the normal growth and prosperity of the city to an incalculable degree.



VIEW OF EAST FOURTH STREET, DUNKIRK AFTER COMPLETION OF BRICK PAVEMENT.

It is true that efforts were made to improve matters by drawing lake gravel on to our principal streets in the hope that a more enduring surface might thus be created. But, as might have been known in advance, this plan proved a costly failure. The round gravel would not bind, and the mud worked up between the stones, which in their turn sunk in the mud till, when it became necessary to excavate Central Avenue, our principal business street, for a sewer, it was found that below the semi-liquid surface there was a stratum of hard packed

DUNKIRK STREET IMPROVEMENT—MIXING AND LAYING CONCRETE FOR FOUNDATION FOR BRICK PAVEMENT.

gravel about four feet in thickness. Last year, however, a new era was inaugurated. Contracts were let for laying nine blocks of Central Avenue with fire brick on a concrete foundation and about the same amount of macadam on West Fourth Street. The brick pavement on Central Avenue was let in two sections, the cost of the first being $2.28 and of the second $2.32 per square yard. The macadam, which is really telford macadam, costing $1.11 per square yard. Two blocks on Lion Street, from Third to Fifth Street, were also laid with fire brick on a concrete foundation at a cost of $2.37 per square yard. This year the improvements have been continued and extended. Second Street from Lion westward for a distance of about four-fifths of a mile has been laid with fire brick on concrete, at a cost of $1.80 per square yard. East Fourth Street, from Central Avenue to Lion Street, has been laid with fire brick on a tamped gravel foundation, at a cost of $1.60 per square yard. The block on Lion Street connecting the brick laid on Lion Street last year with that laid on Second Street this year has been laid with fire brick on concrete at a cost of $1.80 per

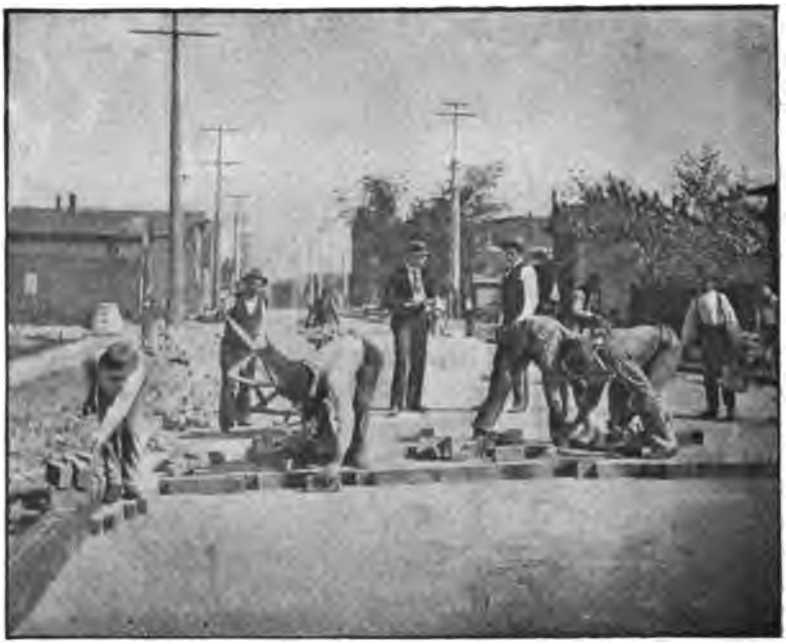
DUNKIRK STREET IMPROVEMENT—BARROWS LOADED WITH BROKEN STONE, ETC., READY FOR MIXING CONCRETE.

square yard. The improvement of Central Avenue has been extended southward from the end of the brick pavement to the city line with macadam at a cost of $1.20 per square yard.

On all streets improved as above the cost includes good stone curbing. It will be seen that we have laid telford macadam about a mile and two-fifths at a cost of $1.11 and $1.20 per square yard, respectively, for different sections, while we have laid about two and a half miles of fire brick at prices varying from $1.80 to $2.37 per square yard for the brick laid on concrete, and $1.60 per square yard for brick laid on gravel.

Of course all this is in the nature of an experiment, but it is already apparent that the factor of economy is in favor of the fire brick laid on a concrete foundation. The brick laid on gravel does not promise to be as lasting as that laid on concrete, while the cost is but little less than that for brick on concrete on Second Street. Macadam, or telford, pavement can never, in my opinion, be a first class success here, because we have not the proper quality of stone in this immediate neighborhood to make a lasting surface. Our stone is not hard enough, and to get hard stone from a distance would increase the cost to an extent that practically makes this kind of pavement as costly as brick. The macadam, however, while less enduring and cleanly than the brick, has the important advantages of being less noisy and much easier on horses than the harder brick. So that, for purely residence streets, like West Fourth Street and the southern portion of Central Avenue, it may still be used to some extent in the future.

As a citizen of Dunkirk, and as a wheelman devoted to the cause of good roads, I have, of course, taken great interest in the progress of this work and have secured, from time to time, instantaneous photographs of the work while actually in progress. Of these I have selected a dozen as of special interest to the readers of Good Roads and submit them herewith.



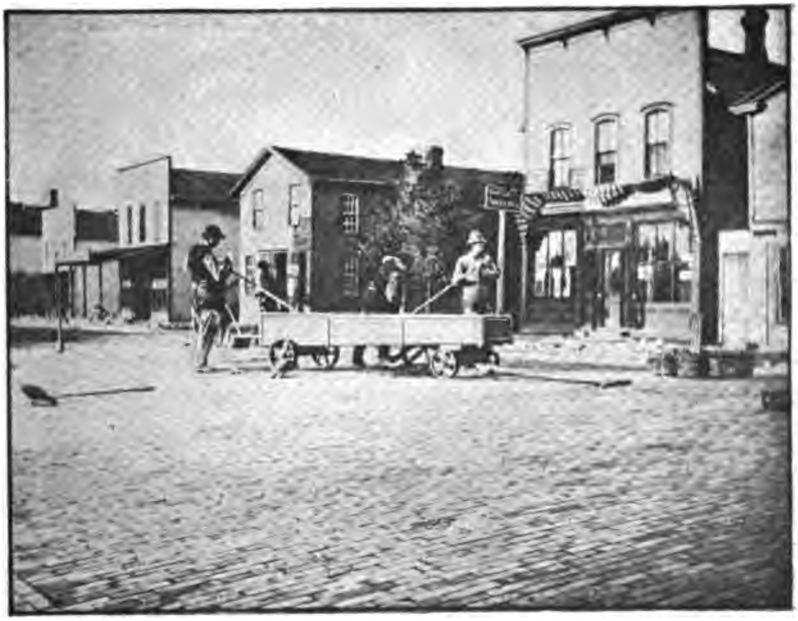
DUNKIRK STREET IMPROVEMENT—LAYING VITRIFIED BRICK PAVEMENT ON SAND LAYER WITH CONCRETE FOUNDATION.

The first shows the condition of East Fourth Street during the Spring rains just before the work of laying the brick pavement began. The next is a view of the same place taken since the pavement was completed. The contrast is sufficiently marked to render any extended commentary superfluous.

Then comes a series showing the details of constructing the brick pavement, viz.:

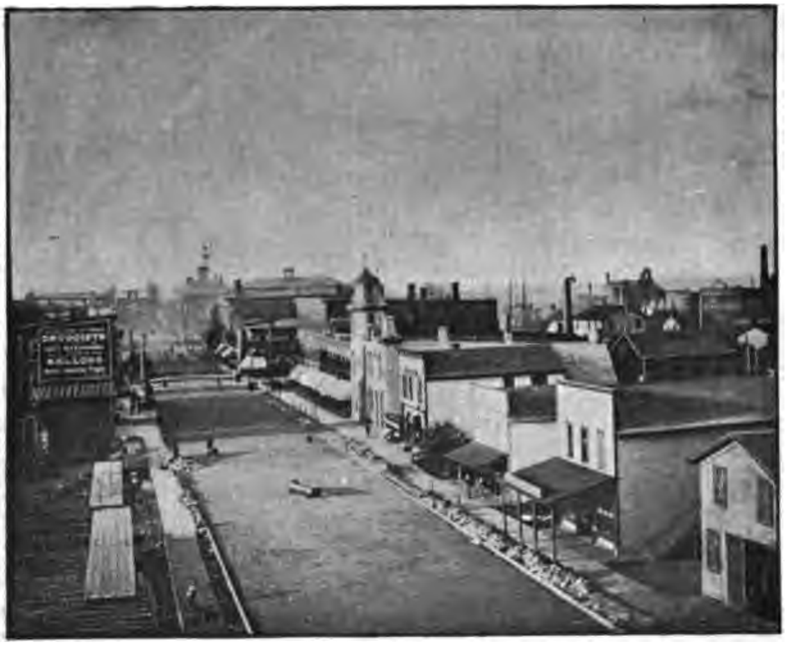
MIXING AND LAYING CONCRETE.

This is done very rapidly, as it is necessary to get the concrete in place and smoothed to a surface before the cement sets. The paper bags of the cement are laid on the mixing boards, broken open with a single blow of a shovel, mixed dry with the proper proportion of gravel, water poured on, and the whole mixed to a coarse mortar, and carried on shovels to the edge of the concrete already laid, dropped into place and smoothed off to grade. Another view shows the barrows full of gravel, etc., ranged ready for the mixing to begin.



FILLING INTERSTICES IN BRICK PAVEMENT WITH CEMENT GROUT FROM PORTABLE TROUGH.

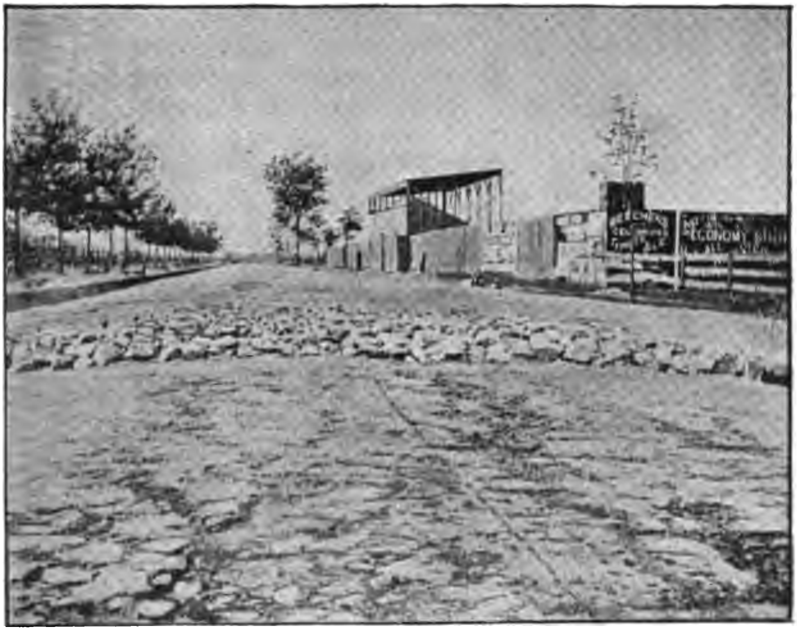
The picture showing the men at work laying the brick on the sand cushion on the concrete gives a very good idea of the method of work and of the arrangement of the brick, which are laid with their long diameters at right angles to the street line, except a sort of selvage, four bricks deep, at each side next the



BRICK PAVEMENT READY FOR TRAFFIC. VIEW LOOKING NORTH FROM HOTEL GRATIOT.

curb where they are laid with their long diameters parallel to the street line, and at street intersections where they are laid diagonally.

After the brick has been laid, and the inspectors have been over the block and pulled out all the cracked, crooked or otherwise imperfect bricks they can find, and replaced them with good ones, a heavy roller is passed over the surface till all bricks are forced down to a uniform height, and the section is then ready for the grouting. This is a mixture of sharp screened lake sand and water-lime cement, with water to the consistency of buckwheat batter in a long trough on wheels, which is filled with the batter and drawn over the surface to be grouted. The mixture is allowed to flow out through a little gate at the back of the trough and is brushed into the interstices between the bricks with large coarse brooms of a peculiar pattern. Sand is then spread over the top of all and the street closed for about a week, by which time the cement in the grouting has set, binding the whole into a practically smooth and solid mass.



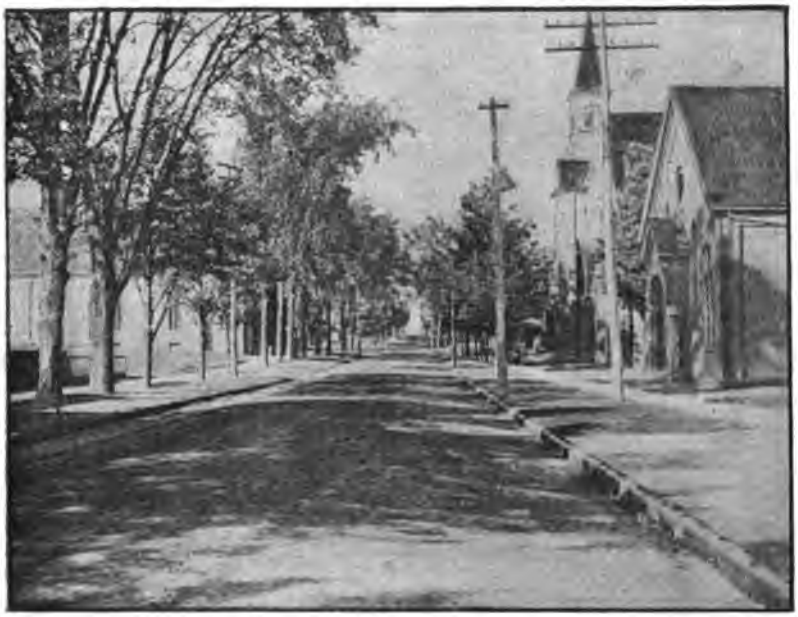
DUNKIRK STREET IMPROVEMENT—VIEW IN SUBURBAN STREET SHOWING TELFORD SUB-PAVEMENT PARTIALLY LAID, AND ROLLED EARTH BOTTOM IN FOREGROUND.

A view taken from the third story of the Hotel Gratiot looking northward shows the appearance of Central Avenue after the brick pavement was completed and before the street was opened for traffic. Two other views show the appearance of the brick pavement in actual use in the business and residence portions of Central Avenue respectively.

The view on West Fourth Street showing the first course of telford was taken beyond the residence limit and shows very fairly the way in which the large flat stones are laid on edge to form the foundation course.

The stone for the upper layers of the (telford) macadam is chiefly what is known hereabouts as "hardheads," *i. e.*, large round stones probably brought here by glacial action in the ice age and rounded by the same agency, and scattered over the surface of the earth.

These are gathered up by the farmers in their off times and brought in by the wagon load and sold to the contractor who stores them up till needed, when they are passed through the stone crusher which chews them up and sorts the fragments into three different sizes, which are delivered into separate bins and used in the order of their fineness, the finest being used for the top or finishing coat, which is then moistened and rolled repeatedly with a heavy roller till the surface is almost as smooth and hard as asphalt pavement. When the street is completed, with its smooth, rounded surface, its neat stone curbing, and its stretches of green sward between the curb and the stone sidewalks, it presents a very attractive appearance, as shown in my last illustration.



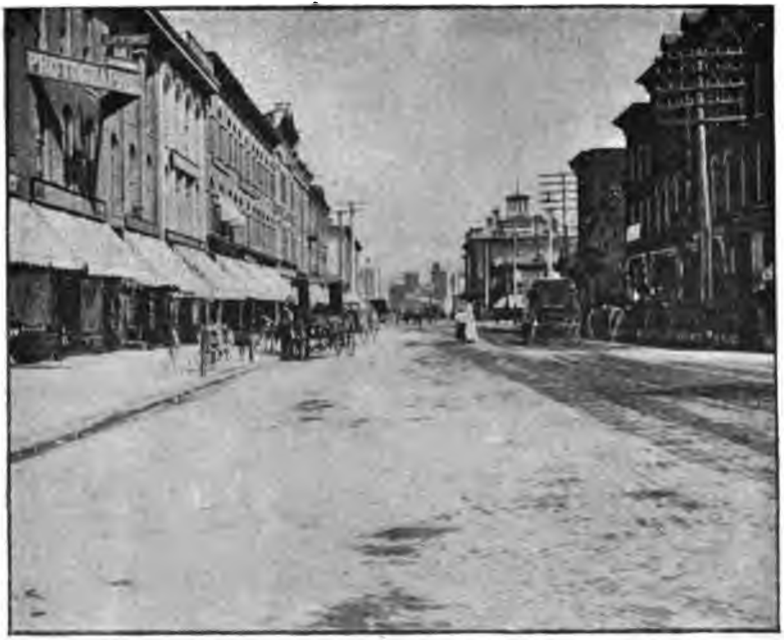
DUNKIRK STREET IMPROVEMENT—VIEW SHOWING FINISHED MACADAM SURFACE, WEST FOURTH STREET.

It will naturally be asked how does all this strike the taxpayers? Well, it comes a little hard on some of them, but as no street has been improved thus far, except upon petition of the majority of the frontage held by resident owners, and in every case a similar vote of resident owners has determined the kind of pavement to be put down, it may be assumed that the taxpayers are, as a whole, well satisfied with their expenditure thus far, and there can be no doubt that the improvement in general appearance, facility of doing business, and in sanitary condition, more than repays the expenditure, to say nothing of the improved morale and local pride which results from having streets which are a credit instead of a disgrace to the city.

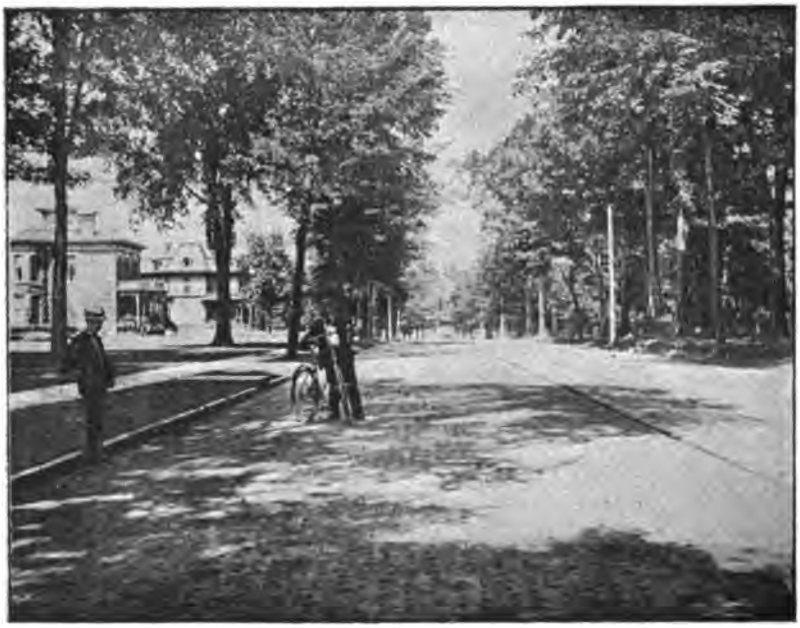
Dunkirk, with its miles of brick and macadam pavement, its elaborate and well-constructed system of sewers, its electric lights, owned by the city and run at an average expense of about ten cents per lamp per night, the water works, owned by the city, its electric railroad and its extensive railroad and lake connections, is now taking the place which it should have taken years ago and which it would have taken had the same intelligent liberality in the matter of good roads which now distinguishes it been made a feature of its early municipal management.

DUNKIRK STREET IMPROVEMENT—CRUSHER "PLANT" ON CENTRAL AVENUE BREAKING STONE FOR MACADAM ROADWAY.

I am under obligations to City Engineer F. A. Dunham and his assistant, Mr. Van Emburgh, for items of extent and cost of the various kinds of pavement.



DUNKIRK STREET IMPROVEMENT—VIEW SHOWING COMPLETED BRICK PAVEMENT IN BUSINESS PORTION (CENTRAL AVENUE).



DUNKIRK STREET IMPROVEMENT—VIEW OF STREET IN RESIDENCE PORTION, SHOWING COMPLETED BRICK PAVEMENT.

MACADAM AND TELFORD ROADS.

By Isaac B. Potter.

I.

A FEW LINES OF HISTORY—ENGLISH ROADS OF THE LAST CENTURY—BAD LAWS, BAD ROADS AND BUSINESS STAGNATION—CRUDE METHODS OF ROAD MAKING AND REPAIR—FIRST EFFORTS FOR REFORM—EDGEWORTH'S TREATISE—JOHN L. MACADAM—HIS PRINCIPLES, METHODS AND WORK—TRESAGUET'S PRIOR WORK IN FRANCE.

JOHN L. MACADAM.

For one who has traveled over the smooth surface of the splendid roadways that are laid like a huge net-work across the fertile acres of France and England, it is difficult to imagine that less than a century ago most of these roads were ill-contrived and wretched mudways, closely similar in appearance and condition—and in the antiquated methods of "labor tax" maintenance to which this condition was mainly due—to the American country roads of to-day. Tracing this condition of things back to its beginning, an English writer* relates how these roads were originally mere foot paths and horse tracks, running in tortuous courses across the country and avoiding every natural obstacle, and that for many years the few meagre efforts, which served here and there to improve their condition, were made by turnpike trusts, empowered by law to levy toll upon the traveler. Macaulay tells how, in 1685, when travel throughout Great Britain was carried on principally by stage coaches, the progress of the traveler was often impeded and sometimes wholly stopped by the impassable condition of the roads, which the historian describes as being one continuous quagmire for miles in succession. Trade became stagnant in the local market, inter-communication between counties a few miles apart was practically out of the question and it was no uncommon thing for the public coach to become mired on the line of its route, and to remain there until lifted out by the service of a yoke of oxen from some adjacent farm.

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* Clark.

Another writer of early English history says that the roads were so bad, and the chain of home trade so feeble, that there was often scarcity of grain in one part and plenty in another part of the same kingdom. Export by sea or river to some foreign market was, in many cases, more easy than the carriage of corn from one market to another within the country. The frequency of local dearths and the diversity and fluctuation of prices were thus extreme. It was out of this general situation that the first corn-laws arose, and they appear to have been wholly directed toward lowering the price of corn. Exportation was prohibited, and home merchandise in grain was in no repute or toleration.

AN ENGLISH LANE OF TO-DAY.

The people of the Essex, Middlesex and Surrey districts, where now exist the counties bearing those names, had the greatest difficulty in carrying their produce to the London market, which they immediately surrounded, while, during long seasons of the year, the interior counties of Leicester, Northampton, Warwick and Worcester were so far away amid the wilderness of bad roads, that business communication was a task too great to be considered. Nor yet for a hundred years and more did these conditions materially improve. In his "Six Months' Tour," published about 1770, Mr. Arthur Young makes emphatic mention of the condition of English roads of that time and even undertakes to describe some of the roads in Northern England as he then found them. He writes:

"*To Wigan.* Turnpike.—I know not, in the whole range of language, terms sufficiently expressive to describe this infernal road. Let me most seriously caution all travelers who may accidently propose to travel this terrible country, to avoid it as they would the devil, for a thousand to one they break their necks or their limbs by overthrows or breakings down. They will here meet with ruts, which I actually measured four feet deep, and floating with mud only from a wet Summer; what, therefore, must it be after a Winter? The only mending it receives is tumbling some loose stones, which serves no other purpose than jolting a carriage in the most intolerable manner. These are not merely opinions, but facts; for I actually passed three carts, broken down, in those eighteen miles of execrable memory. *To Newcastle.* Turnpike.—A more dreadful road cannot be imagined. I was obliged to hire two men at one place, to support my chaise from overturning. Let me persuade all travelers to avoid this terrible country, which must either dislocate their bones with broken pavements, or bury them in muddy sand."

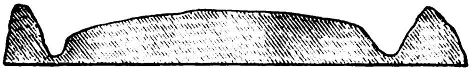

FIG. 1, CROSS SECTION OF ENGLISH DIRT ROAD OF A CENTURY AGO, IN ITS BEST CONDITION, SHOWING CONVEX ROADWAY AND DANGEROUS DITCHES.

During all this period, the English tax payer worked in a crude and unsystematic way, having principally in view the discharge of the road tax obligation imposed by the realm and cancelled by his manual labor upon the public roads. He despised the pretentions of all civil engineers, as indeed, in the main, did the "turnpike trusts," which had themselves been schooled in the same primitive way. In a historical sketch of the roads of England a description of road making, as commonly followed by the British farmer, prior to the time of Macadam, is so aptly expressed that it may well be quoted here:

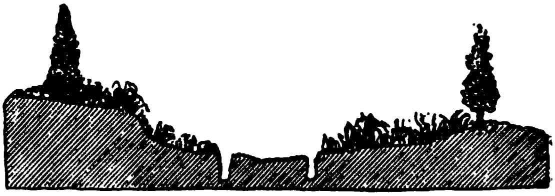

FIG. 2, CROSS SECTION OF ENGLISH "INDICTED" DIRT ROAD IN 1809. ITS FIRST STATE. (FROM AN OLD PRINT.)

"Under the impression that the higher the arch is made, the more easily the road would be drained, the materials were heaped up about the centre till the sides became dangerous, by their slope, for the passage of carriages. The carriages, therefore, ran entirely upon the middle till it was crushed and worn down, and then a fresh supply of material was laid on, and the road was again restored to its dangerous shape. The sides of the road were but little used, except in Summer, or until the heavy wagons had crushed the middle into a surface apparently compact and smooth. In some places, the rough materials were laid in a narrow line, not exceeding seven or eight feet in breadth, along the middle of the road, and the sludge collected from the scraping of the roads or ditches was placed on each side, like banks, to prevent the stones from being scattered by the wheels. * * Carriages were forced for safety or convenience, to keep in the middle, and it was speedily ploughed into deep ruts which held the rain water, even when the convexity approached the form of a semi-circle. The central elevation, therefore, was not kept dry; and the central pressure of the traffic forced the material upon the sides, where they lay loose

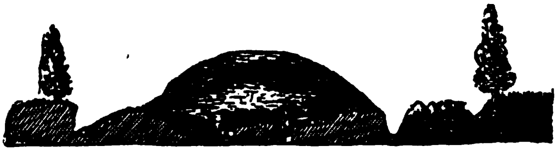

FIG. 3, CROSS SECTION OF ENGLISH "INDICTED" DIRT ROAD, THROWN UP BY PARISH SURVEYOR, TO TAKE OFF THE INDICTMENT. ITS SECOND STATE. (FROM AN OLD PRINT.)

and unconnected, and obstructed the course of water from the middle. The condition of such a road, ploughed and disintegrated is illustrated in section in Fig. 2, when it was probably indicted. It was common for the parish surveyor* after harvest, to make a contract with a stout laborer, who took job work for the reparation of the road, with a special injunction 'to be sure he threw up the road high enough, and made the stones of the old causeway or foot pavement go as far as they could.' The diligent operator fell to work; nor was he stopped by the equinoctial rains in September, for the work must be done, as contracted for, before the Michaelmas sessions. He accordingly produced something like the figure three The clods and rushes were thrown into the bottom, and the soft soil which nourished the vegetation, and all other materials, hard or soft, were laid down, forming a convexity of considerable elevation, according to order; 'barreling' the road, as it was called. The whole was duly surmounted with the stones from the old broken foot path, with a little gravel raked over them, just to keep them together. Finished thus, say by Saturday night, then on the following Monday it was submitted for inspection to two magistrates, on their way to the quarter sessions. How could they possibly refuse to speak the truth ! They certified 'that it was perfectly smooth when they saw it, and that a vast deal had been done since the last time they were there.' But besides tear and wear, decomposition immediately took place in the chaotic mass, and in the second or third year after the repair, the road was reduced to the condition shown in Fig. 4, in its last and worst state."

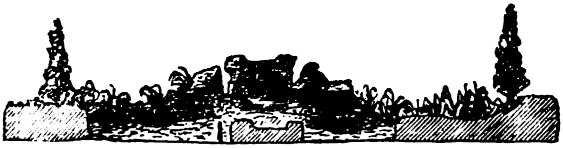

Fig. 4, CROSS SECTION OF ENGLISH DIRT ROAD, SHOWING EFFECT OF WAGON TRAFFIC AFTER "REPAIR." ITS LAST AND WORST STATE. (FROM AN OLD PRINT.)

Other English writers, and many citizens of prominent influence in the affairs of the kingdom, added their protests against the lax development which this long neglect of the public roads had induced; but the sense of the every day citizen was not yet awake to the importance of better things, and for many years these stifling conditions maintained their hold upon the country.

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*The "parish surveyor" in England held office corresponding to that of "path master" or "overseer of highways" in this country.

It cannot at this day be known whether England's first attempts at rational road building were the results of personal study, experiment and the application of common sense principles by certain of her individual subjects, or whether they were induced by the successes attained by the nimble-witted Frenchmen across the channel, who had even then learned how to employ broken stone in the methodical construction of the country roads. It seems, also, that as early as 1817, a Mr. Edgeworth, a landed proprietor in Ireland, published a short treatise on "The Construction of Roads and Carriages," containing certain rules for the making of better roads and an account of the experience and experiments of the writer. As Mr. Edgeworth's essay reached its second edition in 1817, it may be safely assumed that his writings had been made public at some prior date, if, indeed, his experiments had not been carried on for some years; but whatever may be the source from which the British rate payer† drew his first inspiration in the field of scientific road making, it is well conceded that to Macadam is due the vigorous establishment of the better roads and road systems of England and the promulgation of rules and methods which have been practically adopted by all other civilized countries.

About 1816 John L. Macadam assumed direction of the roads of Bristol. For many years previous to that time he had given his attention to the condition of the roads and had put into practice the principles upon which his system is founded, namely: "To put broken stone upon a road, which have united by its own angles, so as to form a solid, hard surface." He said, "It follows that when that material is laid upon the road it must remain in the situation in which it is placed without ever being moved again; and what I find fault with in putting quantities of gravel on the road, is that, before it becomes useful, it must move in its situation, and be in constant motion."‡

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†A term signifying the same as "tax payer" in this country.

‡From report of the Select Committee on the highways of the Kingdom (1819).

Mr. Macadam insisted that no greater convexity should be given to the surface of the road in transverse section than was sufficient to cause rain water to run readily into the side ditches. When he assumed charge of the roads in the Bristol districts, he found them in a most discouraging condition. Stones and dirt were intermingled in reckless disorder, the stones being large and irregular, and this material had accumulated for years, till the roadway was loaded to a depth of two or three feet. He dug out the stones, separated them from the mud, broke them into small, angular pieces of a practically uniform size, none exceeding six ounces in weight; prepared an even road bed, and then relaid the stones in uniform layers and kept his men at work leveling and raking the broken stones during the whole period of consolidation. It was before the days of road rollers, and Macadam depended upon the passing carriages to make smooth and hard the surface of his roadway. By the simple application of common sense principles and without the addition of new material, he provided first for the effective drainage of the roadway, and then, by the simple manipulation of the materials already half buried in the line of the roadway, he brought order out of chaos and established a method of construction and repair, which has supplied a lesson of economy to the Anglo-Saxon race.

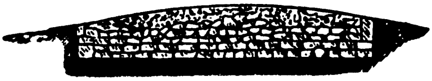

FIG. 5. CROSS SECTION OF FRENCH ROAD PREVIOUS TO 1775.

Macadam believed that the road surface should be preserved by the addition of new materials whenever required, and that these should be spread in thin layers over such portions of the old road as demanded repair. He found it better to add this new material soon after rain and while the old surface was still wet, in order to better insure the binding of the new material with the old. It was a common custom with Macadam to lay his broken stone road so that the separate layers would aggregate ten inches thick and upwards; but it is by no means certain that Macadam believed such a thickness to be necessary, for he is often quoted as saying that broken stone roadways, well consolidated, would sustain the weight and wear of ordinary country traffic when worn to a thickness of only three or four inches.

Macadam appears to have been a man of sterling honesty and a rare intelligence, which, combined with his directness of purpose, practical knowledge and good administrative ability, insured the accomplishment of his great work and the perpetuity of his fame. It will therefore detract nothing from his fame to say that the principal points of his system had been anticipated by other writers. Long before the day of Macadam the people of France had made substantial progress in the art of road building and had adopted methods which, though crude and generally wasteful in their practice, involved some of the principles followed by both Macadam and Telford. About the middle of the eighteenth century the construction of important roadways in France was accomplished by excavating to a depth of twelve inches or more and for a width of about eighteen feet, after which rough stones and boulders of moderately uniform size were laid by hand in several layers on the bottom of the excavation. These were covered with a layer of smaller stones, which were compacted by ramming, and the top surface, which consisted of a layer of smaller broken stones, was then added and raked to conform to the shape of the finished surface. The form of roadway thus in use at that time is shown by typical cross section in figure 5. These roads, while vastly superior to the miserable dirt highways which still cursed the English farmer, had no likeness either in form or utility to the superb highways conceived and made by the Frenchmen of later days. Besides having the surface too abruptly rounded in cross sectional outline (and therefore too steep from centre toward each side of the roadway) they involved the extravagant use of material, violated the best rules of economy in the amount of work necessary to form the excavation and required a vast amount of useless paving material. Some excuse may, however, be urged for this method of construction when it is remembered that down to 1764 France was still trying to maintain her public roads by the antiquated and shiftless system of statute labor, quite similar to that which still obtains within the United States. To guard against the destructive wear and tear which came upon their road during the long seasons which intervened between the Spring and Autumn "repairs" which were carried on by untutored taxpayers, it was deemed necessary to make the thickness of the road material at least eighteen inches at the centre and twelve inches on each side, it being found that with less depth, deep ruts would form and the destruction of the road in many places be wholly consummated. The statute labor system (la corvée) was abolished in 1764, and with that enlightened movement, there dawned an era of scientific knowledge in road building, which led to the economy and utility for which the road system of France has ever since been noted. Road building then came within the special province of the engineer and, by the application of scientific work and knowledge, the depth of the old roadway was reduced to about nine or ten inches, which dimension was maintained uniformly from side to side, and the entire expense of construction diminished more than one-half. After an experience of about ten years, M. Trésaguet, Engineer in Chief of Limoges, gave evidence of the splendid results of the new plan and declared that since the system of constant maintenance had been substituted for the old periodical tinkering under the "road tax system," the roads had been maintained in good condition at all times, and were then in as good condition as when first put down.

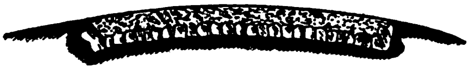

FIG. 6. CROSS SECTION OF FRENCH ROAD, SHOWING METHOD OF CONSTRUCTION ADOPTED BY TRESAGUET, 1775.

The system of Trésaguet, although in use for several years prior to that date, seems to have been first publicly exploited about the year 1775 by the writings of M. Trésaguet himself, and since, as has already appeared, this system involved the use of angular broken stones placed in the line of travel and consolidated by the wheels of vehicles, it may be seen that the advantages of this material was well understood by the French engineers long before the day of Macadam, who flourished nearly half a century later. But notwithstanding the teachings of Trésaguet, the system of constant maintenance came far short of general adoption in France, and after all, it remained for Macadam to demonstrate to the people of both countries how important, if not, indeed, how necessary it was that constant maintenance should supplement the care and method of ordinary construction. The splendid work of Macadam in his redemption of the English road system began to be known in France about the year 1820, and about ten years later the French engineers began to adopt his method of construction and maintenance in the road work of their own country.

CARELESS DRIVING IN MEXICO.

THE following is from the *Mexican Financier*: "Our colleagues of the press here at the capital have taken up the question of regulating the driving of coaches and other vehicles, and we are glad to note a general agreement that the city government should seriously undertake to stop recklessly fast driving. One journal, the *Anglo-American*, urges that coachmen be compelled to pass an examination in the art of driving before they be permitted to appear in the streets. An excellent idea! But we fear that a rigorous examination, say before Alderman Moran, would throw out 90 per cent. of our local coachmen. In no other great city are coachmen more fast, furious and wildly reckless than here. It is the usual comment of foreign visitors that few of them appear ever to have learned the art of driving. And it is an art—otherwise how do we account for the applause and admiration always accorded abroad—in Paris, London and New York—to the driving of amateur coachmen on days of coaching parades. Men and boys filled with pulque, half asleep and engrossed in cigarette making, are not coachmen from the simple fact of having ascended the box of a coach. The ordinary style of driving in our streets would disgrace a country wagoner. We cordially commend the suggested examination and training of coachmen to our excellent city government, some of the members of which are good drivers themselves. In the single item of coach rapairs tens of thousands of dollars would be saved by careful driving. There is not a coach owner in the city who is not in danger of his life every time he takes a drive. One day's bombardment of the city of Mexico would scarcely do as much harm as six months of the present style of driving."

It is not quite so bad in Chicago, but careless driving is sufficiently prevalent for the suggestions to apply.

HOW WE "PIKED" AT METROPOLISVILLE.

By G. Rhodes.

THINGS hev bin so warm in our village of Metropolisville durin the last six months on the good road subjeck, that I deem it the duty of some prominent sitizen to giv the world the facts as to what has been transpirin here lately, so that our reputashun as a live community may not suffer by false reports which may hev got abroad.

I hev bin readin considerable about good roads lately, tho my wife ses my grammer and spellin would go to show that I wasn't in the habbit of readin anything, leastwise in Inglish. Howsumever I hev allus bin successfull in makin people understand what I write even if the words aint put together accordin to Hoyle's Grammer, as the sayin is, and I aint afeard to take the task of settin the country right on our pike doins here in Metropolisville. Before startin out I orter say that I'm a "pike man," one of the original pike men of this town. My blacksmith shop stands in the east end of the town nex to the

"A LOT OF US FELLERS WAS A SETTIN IN JIM LEECHES HARNESS SHOP."

Methodist Church. Everybody round here that amounts to anything knows me, and strangers can easy see my sine which reads "G. Rhodes, Blacksmith. Satisfackshun garanteed or money refunded." Then I'm a member ov the Board ov Helth and third vice-President of the Semitary Assosiashun. The way this thing started—I mean the road agitashun, not the semitary—was like this: One evenin last January or maybe it was in Febuary I disremember which, but I guess it dont really matter tho I'm mitey purtickler in what I say since this pike business come up, but anyway a lot of us fellers was a settin in Jim Leeches harness shop talkin about corn huskin and houn dogs, when old Simmons cum up with his peddler waggin and stuck fast in a mud hole rite in front of Jim's shop. Well he hollered and whipped his old crow-bait for a few minits tryin to pull out, and at last we all had to go out and wade in and push the wheels out. Jasper Barnhart, who runs the big store acrost from Jim's, also cum out and helpt.

Jasper is one of the best fixt men in town. I've allways dun my tradin there because he's got the best stock in town. He's one of the deacons of our church, and has been county commissioner two terms and was a delegate to the legislative convenshun last year, beatin Bill Allen who runs the store at the west end of town. Bill aint felt right about it sence, neither, and their bein in opposition businesses dont serve to make things amicable between em. Then our gettin the town hall located in the east end insted of on the vacant lot acrost from Bill's place kinder set him agin the east end.

Well, after gettin old Simmons out, we all went back to Jim's shop and Jasper says, "Let's get up a petishun to the Councel to pike these streets. They meet to-night and if we hussle, we can get this thing in shape so we can vote on it at the next election, this bein the last meetin before election." So Jasper wrote up a petishun and put his name down first and we all sined it and I started out to get some more siners.

I was sucksessful till I struck Bill Allen's place. When he saw Jasper Barnhart's name he ses, "No sir! I ain't in favor of any such thing. It'll cost too much and the poor people of this town have got too many taxes now—look at the school house tax, the big ditch tax, and the county jail tax. I'm in favor of waitin till them taxes is paid before crushin em with any more taxes. Besides you can't build a street on this mud anyway." I begin to feel like as if I'd been caught robbin a chicken coop, Bill talked so severe. Then Ike Taylor, who runs a one horse blacksmith shop at the west end of town, chimed in, that them was his sentiments too. I hear that Ike's pretty deep in det to Bill Allen, so that accounts for his actions. Just then John Boothby who's been tryin to get to teach one of our schools for the last four years, but hasn't been able to get the chance, come in, and when he saw how things was goin he sided in with Bill because Bill's on the school board. Then Frank Fifer, one of the councilmen, come in, and as he's one of Bill's bosom friends, he soon made up his mind that he was opposed to pikes. I tell you I was glad to get out of there without an open fuss.

"I WAS GLAD TO GET OUT OF THERE WITHOUT AN OPEN FUSS."

Well our petishun was presented that night. There was only four counselmen present, which was a bare quorum. Three of em was in favor of granting the petishun and one was against it. They argued and argued and finally when the thing was about to come to a vote, Bill Allen's oldest boy come in with word that Fifer's wife was sick, so Frank had to leave and the quorum was busted. The counsil then adjourned and bein so flurried, forgot to appoint another meetin before election, so the matter was dropped. When the time come round for nominatin for the spring election us pike men was determined to elect a ticket that was in favor of pikes, so Jasper and a few of us fellows that loafed in the east end of town figured round and got the Democratic ticket fixt with three pike men and one anti-pike man, the latter bein one of Bill Allen's friends to prevent the Allen crowd from goin back on the ticket. Then, as the Republicans are in the minority, we put up some of their leadin men to nominate three anti-pike and one pike counselman, which was done. To say that that election was excitin, is puttin it very mild indeed. Every man was workin for the success of his political party, of course; but when the votes was counted, we had a Republican Mayor and Marshal, a Democratic Street Supervisor and three Democratic and one Republican counselmen all in favor of pikes. I suspect there was a good deal of tradin dun. It is needless to give all the harrowin details of what follered, but the east end of town had a bon fire that night and the west enders claimed that some of our crowd was intoxicated, but there aint a word of truth in that story. During the suckseeding weeks there was a good deal of arguing and readin in law books dun, and when the pike men would find something that would guide em in makin a move, the anti-pikes was certain to find something in the same books that proved it was illegal. Howsumever, it was desided to petishun

"CLAIMED THAT SOME OF OUR CROWD WAS INTOXICATED."

"ARGUIN WITH MRS. ALLEN."

the Legislacher for leave to hold a speshul election and vote for five thousand dollars bonds. I was started out with another petishun. In order to keep the thing quiet we only got about twenty names, which would have been O. K. if Tom Brown hadn't told his wife about it. She is one of the most ardent pike men in town, and in arguing with Mrs. Allen on the all absorbin question, she axidentally let the cat out of the bag, with the result that the anti-pikes sent in a remonstrance with forty names on it. Of course, we had to keep up our end, so we sent in seventy more names for our petishun. Meanwhile the arguin was goin on all over town.

There bein several widder wimmen in town, two of em livin on Main Street, it was one of the anti-pike's greatest arguments that it would ruin these poor wimmen, if they had to do mackadamisin, curbin and gutterin along their property, altho several of em is drawin pensions from the Government. Finally to pacify em we had to start a subscription paper offerin to pay the taxes of two that took in washin for a livin. Then the most amazin stories was started about the cost for pikin; the anti-pike figgers ragin from $3,000 to $10,000 a mile. The ladies sowing sosiety finally nettin the figgers up to a hundred thousand dollars a mile.

"THE LADIES SOWING SOSIETY NETTIN THE FIGGERS UP."

The act got thro the legislacher on the last day of the session and purvided that the tax should be levied on all the property in the village. Then the counsel desided to mackadamise the business part of Main Street, from Broadway to Alley No. 5 in the west end of town. This added fuel to the flaim. The anti-pikes forgetting all about their widder wimmen business, declaired that it wasn't fair for poor laborin men livin on back streets to pay taxes to mackadamise in front of business men's stores, and the rest of the town only gettin common pike. Then they started the story that we intended to pike Alley No. 5 because it was menshuned in the election notiss, and lots of similar nonsense which I cant remember. The commershal travelers had a hard time of it durin this controvercy. Theyd allways bin in the habbet of cussin our bad streets, so they was continually puttin their feet into it, as the sayin is, espeshully when theyd happen into a man's store that was agin pikes, then theyd have to turn it off by sayin, "Yes your streets are in a pretty bad condition, but they're nothin compared with"—then theyd name some town over in the next county, and thus wiggle out of their predikament. It reminded me of the "milk sickness," its allways some place else when you come to hunt it up. Well the eventful day of the election finally come to hand. It had rained for four days previous so Providence seemed to favor our side. The streets was simply awful. The worst place in town was in front of Jim Leeches shop—the waggens usually went down as far as the axle trees would let 'em. Jim arranged a little objeck lesson for election day and went out and hired John Cassady livin four miles south of town, who had got stuck with a balky horse on a trade the week before, to drive into town on election day and get stalled in that mud hole on purpose. The thing worked like a charm. Along about ten o'clock, in comes John with the balky horse and his old gray mare that Ike Taylor nearly ruined by doin a poor job of shoin on her. Us fellows that was onto the skeam was in mortal agony for fear theyd stall before they reached this patickler hole, tho goodness knows there was a good excuse

"MY, WHAT A YELL WENT UP FROM THE VOTIN PLACE."

for stallin anywheres on that street. But they didn't. The thing worked accordin to program. By jerkin on the bit a little that horse would allways balk, and sure enuff John jerked at just the right time and the waggen stuck. My! What a yell went up from the votin place when the crowd saw that insident. Didn't the anti-pikes get a chaffin tho.

The hull crowd finally had to wade out and push the waggen out. I beleave this skeam made us three votes, as there wasn't any of the crowd that new the horse was naturally balky. But I mustn't forgit the mean trick Bill Allen played on us and it nearly beat us too. Bill and the county sheriff are pretty good friends, so he went to him the week of election and had him summon three of our best pike men includin Jasper Barnhart to fill out a petty jury; one of the men had served on a jury once before durin the year so he got off; the other one faned sickness and escaped but Jasper was stuck. I can tell you we was scairt. We had the town poled and new just how many votes we had to carry the day. The law requirin us to have a two thirds majority. But Jasper worked the thing to perfeckshun. He's well acquainted with the judge and bein one of the county sentral comitty and the judge bein a candidate for re-election, Jasper hadn't any trouble in puttin a flee in his ear. So, on election day, just about 11 o'clock when a case was finished, the judge was suddenly took with a bad feelin in his stummick and had to adjourn court till the next day. They say the sheriff looked kinder surprised when the insident happened. Jasper got home in time to vote after drivin thirteen miles through the rain on some of the worst rodes in the United States. The pikes carried the day by one vote over the required number. We didn't have a bon-fire that night as it was a rainin and one majority aint enuff to have a big time on espeshly when the opposition is talkin of contestin the election and hintin about the ballot box bein stuffed.

For the next week the rabidest of the anti-pikes was for sellin out and movin out of town. Bill Allen, whose house is at the south edge of town, tride to prove that his property wasn't in the village at all, claimin that there was a flaw in the plat of his addition to the town which he made himself. But they are calmin down gradually and we are goin to commence fixin up the streets just as soon as the mud dries up a little. I heerd yesterday that Bill Allen was in favor of havin a board of improvement to superintend the street work, and is honeyin around the mayor to get him to use his inflooence to have Bill offered a place on it. Some is in favor of this skeam to keep Bill still.

WHAT A HORSE CAN DO.

A horse will travel four hundred yards in four and one-half minutes at a walk; four hundred yards in two minutes at a trot; four hundred yards in one minute at a gallop. The usual work of a horse is taken at 22,500 pounds raised one foot per minute for eight hours per day. A horse will carry two hundred and fifty pounds twenty-five miles per day of eight hours. An average draught horse will draw 1,600 pounds twenty-three miles per day on a level road, weight of wagon included. The average weight of a horse is 1,000 pounds, and his strength is equivalent to that of five men.

The greatest amount a horse can pull in a horizontal line is nine hundred pounds, but he can only do this momentarily; in continued exertion probably half of this is the limit. He attains his growth in five years, will live twenty-five, average sixteen years. A horse will live twenty-five days on water without food, seventeen days without eating or drinking; but only five days on solid food without drinking.—*Ex.*

In the Iowa good roads convention recently held at Des Moines, a resolution favoring legislation requiring the use of broad tires was referred to the executive committee on the permanent organization. The last day's programme of the convention of a test of broad and narrow tires of wagons; exhibition by steam road rollers on dirt and macadam roads; picking up and remaking macadam, excavation, earth-work by street-graders and by steam rock-crushers. The result of the broad and narrow wagon-tire contest, each wagon being equally loaded, approximating 4,900 pounds each, resulted as follows:

Width of tire	1½ in.	3 in.	4 in.
Soft earth	.663½	.473	.461
Grass seed	.347½	.255	.242

THE WHEELMAN AND THE PUBLIC ROADS.

A Cyclist's Letter to His Wayback Uncle.

VI.

I HAVE now tried to show you, by recounting some facts with which you are not familiar and by suggesting some conclusions which are too clear to be denied, that the bicycle has proved its value in a thousand ways and has established its place as a safe, useful and speedy vehicle—more convenient to use and cheaper to maintain than any other form of carriage employed for the purposes of travel. If, from what I have written, you are willing to grant that a fair foundation exists for these statements, you will now honestly admit that the hundred thousand citizens who ride bicycles within the United States are not "mere proprietors of playthings," and that the common prejudice which has obtained against bicycle riding is not so hopelessly fixed as to prevent a concurrence, and perhaps a co-operation, between the farmers and the wheelmen, on the question of better roads, in which they have a mutual interest.

COL. CHARLES L. BURDETT, OF HARTFORD, CONN., PRESIDENT, LEAGUE OF AMERICAN WHEELMEN.

And let us remember, too, that the movement inaugurated by the wheelmen of America for the betterment of the public roads is not, as may be commonly supposed, founded upon a desire to improve the roads for the mere purposes of bicycle riding, for thousands of wheelmen are land owners and owners of horses, merchants, manufacturers and tradesmen of various kinds, requiring the daily employment of heavy wagons and the transport over our common roads of thousands of tons of crude and finished products. It is true that the riding of bicycles has impressed these gentlemen with the fact that a great waste of labor is involved in the hauling or propelling of any wheeled vehicle over a rough country road or through the deep mud that exists during the rainy seasons of Spring and Fall. They know that the labor necessary to haul a vehicle over these roads is frequently ten times as great as that which the same load and vehicle would require if the road were smooth and hard, as it can be easily made by a simple method of construction, and in trying to impress upon their fellow citizens the great loss of labor, time, horse flesh, wear and tear, which the use of these roads imposes upon the farmer and merchant, they are simply preaching the same sermon that your patient friend, the horse, would have preached a thousand years ago had he been blessed with the gift of speech. Moreover, the prominent wheelmen of this country are men of affairs, occupying high places in social and business life and exerting a wide influence in the several communities where they reside. They command the respect of the entire country and are widely known, not only for

"A GREAT WASTE OF LABOR IS INVOLVED IN HAULING ANY WHEELED VEHICLE THROUGH THE DEEP MUD IN SPRING AND FALL."

their splendid services in the cause of road reform, but for the distinctive personal worth of which their social and professional positions give evidence. They stand at the head of an organization, the largest, most active and most influential ever maintained for accomplishing a material improvement within the State, and their associates throughout the Union are ably fitted to co-operate in carrying on the general work which they have laid out.

THOS. F. SHERIDAN, OF CHICAGO, ILL., FIRST VICE-PRESIDENT, LEAGUE OF AMERICAN WHEELMEN.

Now, in the minds of all these wheelmen, there seems to be a well founded suspicion that the Slowtown method of "working out the road tax" is not calculated to produce a really good highway. It is the method provided by your State laws, (a system of laws borrowed from the statute books of England so long ago that England has almost forgotten that she ever had them,) and the Slowtown farmers cancel this tax by indulging in a kind of holiday, in which very little work is done and a great trade carried on in the swapping of yarns, gossip and political opinions.

DR. G. CARLETON BROWN, OF ELIZABETH, N. J., SECOND VICE-PRESIDENT, LEAGUE OF AMERICAN WHEELMEN.

And this suspicion is confirmed by results with which you are sadly familiar. You know that for weeks at a time these roads are so bad that you are wholly unable to connect with the local market five miles away, and that during long periods in each year your team cannot haul a full load to the railroad station. During much of this time your horses are maintained

"IN THE MINDS OF WHEELMEN THERE IS A WELL FOUNDED SUSPICION THAT THE SLOWTOWN METHOD OF 'WORKING OUT THE ROAD TAX' WILL NOT PRODUCE A REALLY GOOD HIGHWAY."

in idleness at a considerable expense and the several hundred thousand of farm animals in your state are standing still, eating tons of costly fodder under exactly the same conditions. The wheelmen have gone into this question with an earnestness that promises good results. They have collected facts which demonstrate that millions of tons of freight are hauled by the railroad in each state every year and that every pound of this freight is hauled over the common roads at a cost of from thirty to fifty per cent. more than would be expended if these roads were kept in even fairly passable condition. They have gathered statistics which show that this loss amounts to more than twenty millions of dollars per year to the farmers and merchants of a single state, and by their efforts it is every day becoming more apparent that the gospel of good roads is a gospel of economy and thrift and development and eventually of wealth to the entire State.

A COUNTRY ROAD IN FRANCE. THE BEST ROAD FOR THE FARMER AND FOR EVERYBODY. THIS ROAD IS NOT MAINTAINED BY "LABOR TAX."

Think of these things, my dear uncle, and forgive the wheelman for any seeming folly that he may have committed within your knowledge. Remember that he brings zeal and industry and perseverance into a work for reform in which you have a vital interest and which promises for you and for your neighbor greater benefits than will inure to any other industrial class within the nation. Put yourself on familiar terms, if possible, with the wheel and with the wheelman. Take his statements, his pamphlets and his communications and consider them. If you believe in the great reform for which he is laboring, lend a friendly ear and a helping hand to his efforts and join forces with him in the attainment of an object in which you have the greatest share of the common interest, and if you cannot agree with the wheelman in his arguments nor aid him in his methods, I beg you to remember the philanthropy of his mission, to exercise the charity that kills prejudice, and to use your benevolent influence to displace the malice of your Slowtown neighbors and invite their respectful consideration.

Your affectionate nephew,

CASPER TABOIT.

"Good Roads" offers $100 in cash prizes for photographs showing good and bad roads throughout the country. Competition is now open and the roads are in condition for obtaining excellent pictures. See our announcement in advertising pages, October number, or send to the editor for circular announcement containing full particulars.

The December number of "Good Roads" will be an "Illinois number." The January number will be a "Massachusetts number." The February number will be a "New York number." The March number will be a "Pennsylvania number." Send us photographs, facts, statistics, to aid this special work for your State.

Are you doing anything to help this work? When you have read your "Good Roads" hand it to your friend, the Surveyor, the Civil Engineer, the Town Officer, or the Editor of your local paper and ask him to subscribe. We pay liberal commissions to all persons obtaining paid subscribers.

A FAMOUS INDIAN STORY.*

(*Continued.*)

Deerslayer had now a different, though a desperate, project in view. Abandoning all thoughts of escape by woods, he made the best of his way toward the canoe. He knew where it lay; could it be reached, he had only to run the gauntlet of a few rifles, and success would be certain. None of the warriors had kept their weapons, which would have retarded their speed, and the risk would come either from the uncertain hands of the women, or from those of some well-grown boy; though most of the latter were already out in hot pursuit. Everything seemed propitious to the execution of this plan, and the course being a continued descent, the young man went over the ground at a rate that promised a speedy termination to his toil.

"THE CHASE WAS RENEWED."

As Deerslayer approached the point, several women and children were passed, but, though the former endeavored to cast dried branches between his legs, the terror inspired by his bold retaliation on the redoubted Panther was so great, that none dared come near enough seriously to molest him. He went by all triumphantly, and reached the fringe of bushes. Plunging through these, our hero found himself once more in the lake, and within fifty feet of the canoe. Here he ceased to

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*This selection is from the famous *Leather Stocking* series of James Fenimore Cooper, who gives us in "Deerslayer" the most graphic and popular story of backwoods life in the English language. His hero, Natty Bumpo, passes through many adventures under the names of Deerslayer, Hawkeye, Pathfinder and Leather Stocking His nearest companion is a chief of the Mohicans, or Delaware Indians, and is known as Chingachgook, or the "Big Serpent." The latter's betrothed, a beautiful Indian girl, has been captured by the Iroquois or Mingos. The faithful Deerslayer aids his Indian friend in rescuing the girl from their enemies, but is himself taken prisoner. At this point our story begins.

run, for he well understood that his breath was now all important to him. He even stooped, as he advanced, and cooled his parched mouth by scooping up water in his hand to drink. Still the moments pressed and he stood at the side of the canoe. The first glance told him that the paddles had been removed. This was a sore disappointment, after all his efforts, and for a single moment he thought of turning, and of facing his foes by walking with dignity into the centre of the camp again. But an infernal yell, such as the American savage alone can raise, proclaimed the quick approach of the nearest of his pursuers, and the instinct of life triumphed. Preparing himself duly, and giving a right direction to its bows, he ran off into the water bearing the canoe before him, threw all his strength and skill into a last effort, and cast himself forward so as to fall into the bottom of the light craft without materially impeding its way. Here he remained on his back, both to regain his breath and to cover his person from the deadly rifle. The lightness which was such an advantage in paddling the canoe, now operated unfavorably. The material was so like a feather, that the boat had no momentum ; else would the impulse in that smooth and placid sheet have impelled it to a distance from the shore that would have rendered paddling with the hands safe. Could such a point once be reached, Deerslayer thought he might get far enough out to attract the attention of Chingach-

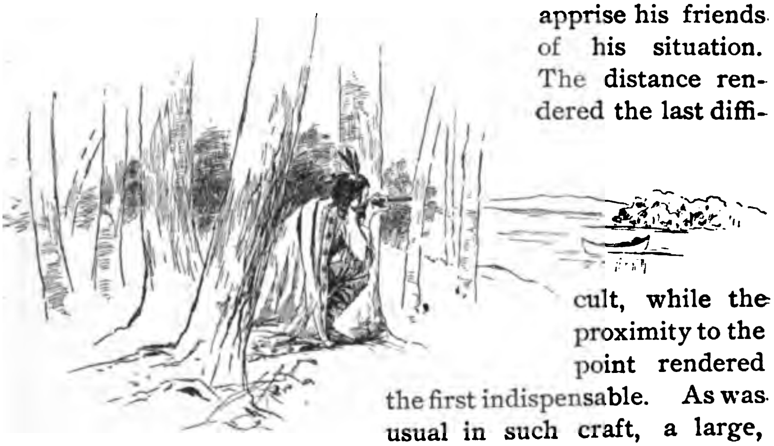
"THE WOMEN ENDEAVORED TO CAST DRIED BRANCHES BETWEEN HIS LEGS."

gook and Judith, who would not fail to come to his relief with other canoes, a circumstance that promised everything. As the young man lay in the bottom of the canoe, he watched its movements by studying the tops of the trees on the mountain-side, and judged of his distance by the time and the motion. Voices on the shore were now numerous, and he heard something said about managing the raft, which, fortunately for the fugitive, lay at a considerable distance on the other side of the point.

Perhaps the situation of Deerslayer had not been more critical that day than it was at this moment. It certainly had not been one-half as tantalizing. He lay perfectly quiet for two or three minutes, trusting to the single sense of hearing, confident that the noise in the lake would reach his ears did any one venture to approach by swimming. Once or twice he fancied that the element was stirred by the cautious movement of an arm, and then he perceived it was the wash of the water on the pebbles of the strand; for, in mimicry of the ocean, it is seldom that those little lakes are so totally tranquil as not to possess a slight heaving and settling on their shores. Suddenly all the voices ceased, and a death-like stillness pervaded the spot; a quietness as profound as if all lay in the repose of inanimate life. By this time the canoe had drifted so far as to render nothing visible to Deerslayer, as he lay on his back, except the blue void of space, and a few of those brighter rays that proceed from the effulgence of the sun, marking his proximity. It was not possible to endure this uncertainty long. The young man well knew that the profound stillness foreboded evil, the savages never being so silent as when about to strike a blow—resembling the stealthy foot of the panther ere he takes his leap. He took out a knife, and was about to cut a hole through the bark, in order to get a view of the shore, when he paused from the dread of being seen in the operation, which would direct the enemy where to aim their bullets. At this instant a rifle *was* fired, and the ball pierced both sides of the canoe within eighteen inches of the spot where his head lay. This was close work, but our hero had too lately gone through that which was closer to be appalled. He lay still half a minute longer, and then he saw the summit of an oak coming slowly within his narrow horizon.

Unable to account for this change, Deerslayer could restrain his patience no longer. Hitching his body along with the utmost caution, he got his eye at the bullet-hole, and fortunately commanded a very tolerable view of the point. The canoe, by one of those imperceptible impulses that so often decide the the fate of men as well as the course of things, had inclined southerly, and was slowly drifting down the lake. It was lucky that Deerslayer had given it a shove sufficiently vigorous to send it past the end of the point ere it took this inclination, or it must have gone ashore again. As it was, it drifted so near it as to bring the tops of two or three trees within the range of the young man's view, as has been mentioned, and indeed to come in quite as close proximity with the extremity of the point as was at all safe. The distance could not much have exceeded a hundred feet, though fortunately a light current of air from the southwest began to set it slowly off shore.

Deerslayer now felt the urgent necessity of resorting to some expedient to get farther from his foes, and, if possible, to apprise his friends of his situation. The distance rendered the last difficult, while the proximity to the point rendered the first indispensable. As was usual in such craft, a large, round, smooth stone was in each end of the canoe, for the double purposes of seats and ballast; one of these was within reach of his feet. This stone he contrived to get so far between his legs as to reach it with his hands, and then he managed to roll it to the side of its fellows in the bows, where the two served to keep the trim of the light boat, while he worked his own body as far aft



"REMOVING HIS CAP, HE PUT IT ON THE END OF THIS STICK AND JUST LET IT APPEAR OVER THE EDGE OF THE CANOE."

as possible. Before quitting the shore, and as soon as he perceived that the paddles were gone, Deerslayer had thrown a bit of dead branch into the canoe, and this was within reach of his arm. Removing the cap he wore, he put it on the end of this stick, and just let it appear above the edge of the canoe, as far as possible from his own person. This ruse was scarcely adopted before tbe young man had a proof how much he had underrated the intelligence of his enemies. In contempt of an artifice so shallow and common-place, a bullet was fired directly through another part of the canoe, which actually grazed his skin. It would seem that this second artifice was unseen, or what was more probable, the Hurons, feeling certain of recovering their captive, wished to take him alive.

Deerslayer lay passive a few minutes longer, his eye at the bullet-hole, however, and much did he rejoice at seeing that he was drifting gradually farther and farther from the shore. When he looked upward, the tree-tops had disappeared, but he soon found that the canoe was slowly turning, so as to prevent his getting a view of anything at his peephole but of the two extremities of the lake. He now bethought him of the stick, which was crooked, and offered some facilities for rowing, without the necessity of rising. The experiment succeeded, on trial, better even than he had hoped, though his great embarrassment was to keep the canoe straight. That his present manœuvre was seen soon became apparent by the clamor on the shore, and a bullet entering the stern of the canoe, traversed its length, whistling between the arms of our hero, and passed out at the head. This satisfied the fugitive that he was getting away with tolerable speed, and induced him to increase his efforts. He was making a stronger push than common, when another messenger from the point broke the stick out-board, and at once deprived him of his oar. As the sound of voices seemed to grow more and more distant, however, Deerslayer determined to leave all to the drift until he believed himself beyond the reach of bullets. This was nervous work, but it was the wisest of all the expedients that offered; and the young man was encouraged to persevere in it by the circumstance that he felt his face fanned by the air, a proof that there was a little more wind.

By this time Deerslayer had been twenty minutes in the canoe, and he began to grow a little impatient for some signs of relief from his friends. The position of the boat still prevented his seeing in any direction, unless it were up or down the lake; and though he knew that his line of sight must pass within a hundred yards of the castle, it in fact passed that distance to the westward of the buildings. The profound stillness troubled him also, for he knew not whether to ascribe it to the increasing space between him and the Indians, or to some new artifice. At length, wearied with fruitless watchfulness, the young man turned himself on his back, closed his eyes, and awaited the result in determined acquiescence. If the savages could so completely control their thirst for revenge, he was resolved to be as calm as themselves, and to trust his fate to the interposition of the currents and air.

Some additional ten minutes may have passed in this quiescent manner on both sides, when Deerslayer thought he heard a slight noise, like a low rubbing against the bottom of his canoe. He opened his eyes of course in expectation of seeing the face or arm of an Indian rising from the water, and found that a canopy of leaves was impending directly over his head. Starting to his feet the first object that met his eye was Rivenoak, who had so far aided the slow progress of the boat as to draw it on the point, the grating on the strand being the sound that had first given our hero the alarm. The change in the drift of the canoe had been altogether owing to the baffling nature of the light currents of air, aided by some eddies in the water.

"THE FIRST OBJECT THAT MET HIS EYE WAS RIVENOAK."

"Come, said the Huron, with a quiet gesture of authority to order his prisoner to land; "my young friend has sailed about till he is tired; he will forget how to run again, unless he uses his legs."

"You've the best of it, Huron," returned Deerslayer, stepping steadily from the canoe, and passively following his leader to the open area of the point; "Providence has helped you in an unexpected manner. I'm your prisoner ag'in."

"My young friend is a moose!" exclaimed the Huron. "His legs are very long; they have given my young men trouble. But he is not a fish; he cannot find his way in the lake. We did not shoot him; fish are taken in nets, and not killed by bullets. When he turns moose again, he will be treated like a moose."

"Ay, have your talk, Rivenoak; make the most of your advantage. 'Tis your right, I suppose, and I know it is your gift. On that p'int there'll be no words atween us; for all men must and ought to follow their gifts." * * *

"My hour is come, I do suppose;" continued Deerslayer, "and what must be, must. If you are bent on the tortur', I'll do my indivors to bear up ag'in it, though no man can say how far for his natur will stand pain until he's been tried."

Rivenoak now directed the proper person to bind the captive. This expedient was adopted, not from any apprehensions that he would escape, or from any necessity, that was yet apparent, of his being unable to endure the torture with his limbs free, but from an ingenious design of making him feel his helplessness, and of gradually sapping his resolution by undermining it, as it might be, little by little. Deerslayer offered no resistance. He submitted his arms and his legs, freely if not cheerfully to the ligaments of bark. As soon as the body of Deerslayer was withed in bark sufficiently to create a lively sense of helplessness, he was literally carried to a young tree, and bound against it, in a way that effectually prevented him from moving as well as from falling. The hands were laid flat against the legs, and thongs were passed over all, in a way nearly to incorporate the prisoner with the tree. His cap was then removed, and he was left half standing, half sustained by his bonds, to face the coming scene in the best manner he could.

The refusal of Deerslayer to accept Sumach as a wife was deemed an insult to the whole tribe. It became a point of honor to punish the pale-face who disdained a Huron woman, and more particularly one who coolly preferred death to relieving the tribe from the support of a widow and her children. The young men showed an impatience to begin to torture that Rivenoak understood, and, as his elder associates manifested no disposition to permit any longer delay, he was compelled to give the signal for the infernal work to proceed.

It was one of the common expedients of the savages, in their tortures, to put the nerves of their victims to the severest proofs. On the other hand, it was a matter of Indian pride to betray no yielding to terror or pain; but for the prisoner to provoke his enemies to such acts of violence as would soonest produce death. Many a warrior had been known to bring his own sufferings to a more speedy termination by taunting reproaches and reviling language, when he found that his physical system was giving way under his agony of sufferings. This happy expedient, of taking refuge from the ferocity of his foes in their passions, was denied Deerslayer, however, by his peculiar notions of the duty of a white man; and he had stoutly made up his mind to endure everything in preference to disgracing his color.

No sooner did the young men understand that they were at liberty to commence, than some of the boldest and most forward among them sprang into the arena, tomahawk in hand. Here they prepared to throw that dangerous weapon, the object being to strike the tree, as near as possible to the victim's head, without absolutely hitting him. This was so hazardous an experiment, that none but those who were known to be exceedingly expert with the weapon were allowed to enter the lists at all, lest an early death might interfere with the expected entertainment. In the truest hands, it was seldom that the captive escaped injury in these trials; and it often happened that death followed, even when the blow was not premeditated.

The first youth who presented himself for the trial was called the Raven, having as yet had no opportunity of obtaining a more warlike sobriquet. He was remarkable for high pretension, rather than for skill or exploits; and those who knew his character thought the captive in imminent danger, when he took his stand and poised the tomahawk. Nevertheless, the young man was good-natured, and no thought was uppermost in his mind, other than the desire to make a better cast than any of his fellows. After a suitable number of flourishes and gesticulations, that promised much more than he could perform, the Raven let the tomahawk quit his hand. The weapon whirled through the air with the usual evolutions, cut a chip from the sapling to which the prisoner was bound, within a few inches of his cheek, and stuck in a large oak that grew several yards behind him. This was decidedly a bad effort, and a common sneer proclaimed as much, to the great mortification of the young man. On the other hand, there was a general but suppressed murmur of admiration at the steadiness with which the captive stood the trial. The head was the only part he could move, and this had been purposely left free, that the tormentors might have the amusement, and the tormented endure the shame of dodging and otherwise attempting to avoid the blows. Deerslayer disappointed these hopes, by a command of nerve that rendered his whole body as immovable as the tree to which it was bound. Nor did he even adopt the natural and usual expedient of shutting his eyes; the firmest and oldest warrior of the red-man never having more disdainfully denied himself this advantage, under similar circumstances.

"THE FIRST YOUTH WHO PRESENTED HIMSELF FOR THE TRIAL WAS CALLED RAVEN."

The Raven had no sooner made his unsuccessful and puerile effort, than he was succeeded by le Daim-Mose, or the Moose, a middle-aged warrior, who was particularly skilful in the use of the tomahawk, and from whose attempt the spectators confidently looked for gratification. This man had none of the good-nature of the Raven, but he would gladly have sacrificed the captive to his hatred of the pale-faces generally, were it not for the greater interest he felt in his own success as one particularly skilful in the use of this weapon. He took his stand quietly, but with an air of confidence, poised his little axe but a single instant, advanced a foot with a quick motion, and threw. Deerslayer saw the keen instrument whirling towards him, and believed all was over; still he was not touched. The tomahawk had actually bound the head of the captive to the tree, by carrying before it some of his hair; having buried itself deep beneath the soft bark. A general yell expressed the delight of the spectators, and the Moose felt his heart soften a little towards the prisoner, whose steadiness of nerve alone enabled him to give this evidence of his consummate skill.

(*To be concluded next month.*)

RAILROAD STATISTICS.

THE railway mileage in the United States is 163,597.05 miles. Michigan shows the largest increase within the last year. The total length of track for the United States, including all tracks, sidings, and spurs, is 209,060.67 miles. The number of railway corporations is 1,797. The total number of locomotives in the United States is 29,928. The number of cars used is 1,164,138. The number of tons of freight carried one mile per freight-engine is 4,721,627, and the number of passengers carried one mile per passenger engine is 1,413,142. The total number of men employed on the railways is 749,301. The 156,404.06 miles of line which are made the basis of statistics are represented by railway capital to the amount of $9,459,444,175, which is equivalent to $60,481 per mile of line. Assuming that the remaining mileage is capitalized at the same rate, the total capitalization of railway property in the United States would be $9,894,483,400. The increase in railway capital for the last year is $444,263,798. The total number of persons reported by railways as killed during the year was 6,320, and the number injured was 20,034. Of the killed, 2,451 were employees, 385 passengers, and 3,584 were classed as "other persons." The latter included a large number of suicides. Of the injured, 22,390 were employees, 2,444 passengers, besides 4,200 unclassified. The largest number of casualties occur to men engaged in handling trains. Railway travel is found to be least safe in the States south of the Potomac and Ohio Rivers.—*Troy Standard.*

THE EDITORS TABLE

Good Roads *offers* $100 *in cash prizes for photographs representing good or bad roads throughout the country. See announcement in advertising pages, October number, or send to the Editor for full particulars. If the roads are bad in your locality send us photographs, even though you do not compete for the prize. We shall publish a State edition of* Good Roads *for each of the principal States and due credit will be given to all parties contributing photographs to this work.*

This is the season for active work for improved roads. The roads are getting worse day by day and the legislatures will meet in the several States within a few weeks. If your club would like to contribute one hundred copies of Good Roads *to the prominent farmers and merchants of your county, or to the members of your State legislature, they will be supplied to you at cost price. Write to us for terms and club rates*

The news of the month has brought nothing more gratifying than the assurance that Colonel Pope's plan for a comprehensive roads exhibit at the World's Fair has been given new life and that the prospect of its success is now most promising. Colonel Pope is now officially advised that Mr. Buchanan, chief of the agricultural department, has been entrusted with the supervision of this exhibit by Director-General Davis, and that a creditable display will be made, and a number of Senators and Representatives in Congress have added assurances of their support of a bill appropriating money for a suitable building for such an exhibit. Colonel Pope is arranging for the introduction of the necessary appropriation bill when the present Congress meets in December next, and a lively canvass will be made to insure its passage. Petitions will be sent to Congress from all parts of the country urging prompt and favorable action and it behooves each worker for better roads to lend a hand in the attainment of that end. As soon as the bill is prepared we shall be ready to supply from the office of Good Roads, blank petitions, and these will be sent to our friends and readers throughout the country for as many signatures as can be obtained.

Election day has come and gone, and without saying anything touching the general differences of the great political parties, we feel at liberty to express our pleasure in knowing that the "vest pocket" vote of the wheelmen and their co-workers for good roads has had its effect. It may not be generally known to the politicians that this vote wields the balance of power in at least five important States, and that during the last two months a good deal of quiet work has been going on by which a unity of action has been secured in favor of the candidates who are active for the improvement of the roads, and against those who were not. It would be impossible to enumerate here the minor and local offices which have been affected by this movement, but it may be reasonably suspected that the friends of Governors-elect Russell of Massachusetts and Altgeld of Illinois (both pronounced adherants of the cause for better roads) are not unconscious of the quiet work that has been done in their behalf.

The December number of Good Roads will be an "Illinois Edition." It will contain articles by Governor-elect Altgeld and prominent editors and public men of that State. It will have special force and value within the State of Illinois. When you have read your December number, if you feel like aiding your Illinois friends, send it to Chief Consul F. W. Gerould, 108 Madison Street, Chicago, Ill. He will see that it is placed where it is likely to do the most good.

NEWS AND COMMENT

REPORT OF JOINT COMMITTEE REPRESENTING THE STATE DIVISIONS OF NEW YORK AND CONNECTICUT IN THE AWARD OF PRIZES OFFERED FOR PHOTOGRAPHS FOR GOOD AND BAD ROADS.

The Committee would report as follows:

The photographs submitted in this competition are in most cases excellent. The several competitors seem to have used good judgment in the selection of subjects, and in many cases the quality of the photographic work is worthy of high approval. After careful deliberation the committee has decided as follows:

That the two competitors, "Cosmos" (Prof. L. M. Haupt of Philadelphia, Pa.) and "Hoosier' (C. Heimberger & Son, New Albany, Ind.) present photographs so equal in point of merit under the terms of competition that it is impossible, as between these two competitors, to select the superior exhibit; but as they are both clearly ahead of other competitors, it has been decided to award the two first prizes to "Cosmos" and "Hoosier" by giving an equal sum of $40 to each. The third prize is awarded to "Little John" (N. McDonald, Augusta, Ill.)

The following named competitors have presented pictures of such excellent merit as to fairly entitle them to honorable mention: "Eciffo," "Nicholas," "Franklin," "Pink Merville," "No. 1624," "Apollo Belvidere," "John Smith" and "Mud."

CALHOUN LATHAM,
F. P. PRIAL,
ISAAC B. POTTER,
Committee.

MR. W. M. P. BOWEN, of the L. A. W. National Highway Improvement Committee, and Mr. Isaac H. Southwick, Jr., Chairman of the Rhode Island Highway Improvement Committee, have sent out, in circular form, a chapter of force and logic addressed "To those who love Rhode Island" and containing an appeal for good roads in the little that must bear fruit. The splendid services of Mr. Bowen are beginning to have effect in many parts of the country and the lively interest now shown by the public men in his own state is doing no small part to aid his persistent and well directed work. The League has great reason to be proud of him.

THE "Asbury Park Wheelmen" (N. J.) have a street improvement committee, and its work runs in a practical direction. Mr. C. R. Zacharias, Chairman of the Committee (and a member of the New Jersey Division Road Improvement Committee), writes us a letter which the members of every bicycle club in the country should read. He says: "At a meeting of the Asbury Park Wheelmen the street improvement committee was authorized to have sent 100 copies of GOOD ROADS for six months to farmers and others throughout Monmouth County. I mail you herewith a list of over 100 names of persons whom we desire to have receive the August and September issues of GOOD ROADS. Use your own judgment in selecting 100 names for the other four months. I send check to your order to pay full subscription price. We intend to agitate the road question throughout the country and early next Spring we shall call a meeting of the farmers and others interested at Freehold and will endeavor to secure improved roads for this section. (Signed) C. R. ZACHARIAS."

HERE is a letter of like spirit from Arizona: "Please send GOOD ROADS regularly to the Maricopa Club, Phœnix, and the Commercial Club, Tucson, Arizona. These two clubs are composed of business men exclusively and comprise our best, most influential and most wealthy citizens. As soon as Arizona is established as a consulate I shall advocate putting all our funds into subscriptions for GOOD ROADS and have it sent regularly to parties of influence and institutions where the magazine will be constantly before the public. W. L. PINNEY."

CONTRACT NOTES

ROADS AND STREETS.

NEW YORK.—ALFRED.—Messrs. Dunham & Boughton, of Plainfield, N. J., are at work preparing estimates, etc., for the proposed macadamizing of several of the streets in this village.

BROOKLYN.—Bids will be received for some time by the Commissioner of City Works for paving four streets with cobblestones and one with Belgian block.

Paving with brick is to be commenced on Greene Avenue between Bedford and Nostrand Avenues.

BUFFALO.—It has been thought advisable by the Street Committee to pave six of the streets of this city with asphalt.

NEW YORK.—Eight contracts for flagging, grading and paving, etc., will be let until November 10, for which the Commissioner of Public Works will receive bids. $3,500 has been authorized to be devoted to the work of laying new streets here.

TROY.—Three streets, Third, Adams and Washington, are to have brick pavements.

DUNKIRK.—Three streets are to have vitrified brick pavements laid this Fall.

YONKERS.—Main Street from the N. Y. C. Depot to the Square is to be paved with Belgian block, and Warburton Avenue is to be covered for a mile and a half with asphalt, the first appearance of this material on the streets of this city.

CALIFORNIA.—OAKLAND.—Four blocks of Main Street are to be paved with vitrified brick.

REDLANDS.—Vitrified brick paving is to be commenced in this place. Bids will probably be asked for.

SAN FRANCISCO.—Brick paving will be begun in San Carlos Avenue between Nineteenth and Twentieth Streets.

MICHIGAN.—DETROIT.—Much work is being done here in the way of roadway improvement, vitrified brick being largely used for that purpose.

BENTON HARBOR.—Cedar blocks are to be used in this city for new pavements, and it is likely that about $20,000 will be spent for the purpose.

MINNESOTA.—DULUTH.—Piedmont Avenue from Superior to Lake Avenue is to be improved, brick paving being included.

CONNECTICUT.—NEW HAVEN.—Ashmun Street is to be paved with vitrified brick.

DISTRICT OF COLUMBIA.—WASHINGTON.—Proposals will shortly be issued for the work of paving two or more principal streets with brick, the experiment on one street having proved so successful.

WISCONSIN.—EAU CLAIRE.—Proposals will shortly be issued for paving with vitrified brick four of the streets of this place.

PENNSYLVANIA.—PITTSBURG.—Bids will probably be asked for at an early date for the work of paving and grading thirteen streets.

OREGON.—LEWISTON.—Street improvements are to be made in this city, the plans and estimates for which are to be prepared immediately, so that the work may be completed by the Spring. Bids will probably be asked for at an early date.

TENNESSEE.—KNOXVILLE.—About 30,000 square yards of paving is reported to be laid this Fall. Bids will probably be asked for.

MEMPHIS.—One street in this city is to be paved by vote of the City Council, and the estimated cost of the work is about $14,000.

GEORGIA.—AUGUSTA.—Another block on Broad Street is to be paved with asphalt by order of the City Council.

OHIO.—TOLEDO.—Vitrified brick paving is to be begun in about twenty-five streets.

DAYTON.—One street, Stanley, is to be brick paved.

FREMONT.—The Committee on Improvement will receive bids until November 21, for the improvement of Morrison Street.

CLEVELAND.—Until November 23, the Board of Public Works will receive bids for about 18,400 square yards of wood paving on the iron portions of the Central and Pearl Street viaducts.

WARREN.—Vitrified brick paving is to be commenced in two streets by vote of the City Council.

MISSOURI.—SEDALIA.—The Committee on Streets will shortly ask for bids for paving Third Street with asphalt, as the plans and estimates have been directed to be prepared by the City Engineer.

NEW JERSEY.—NEWARK.—Forrest Street is to be improved and bids will be asked for the work. David Young, Township Surveyor.

NEBRASKA.—OMAHA.—Proposals will shortly be asked for paving L Street with vitrified brick. Further information can be had of the Committee on Streets.

ILLINOIS.—QUINCY.—The specifications for the work of paving Broadway, Sixth and Eighth Streets provide that the pavement shall consist of four inches of macadam at the bottom, then six inches of river sand, then the lower course of brick, then one inch of sand, and finally the course of paving brick.

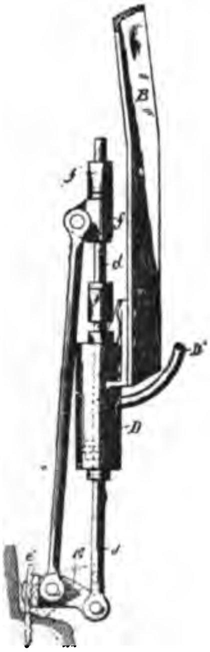
INDIANA.—GREENCASTLE.—Vitrified brick pavement is to be laid in this city.

INDIANAPOLIS.—A final resolution for new pavement in Vermont Street has been adopted by the Board of Public Works.

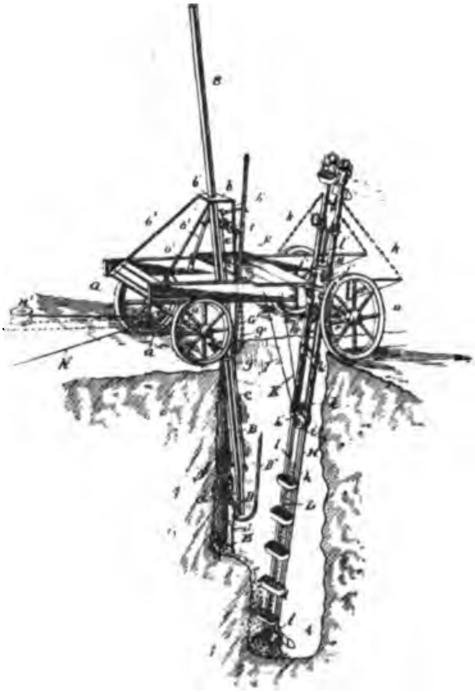
Brick paving will be commenced on the different sections of Meridian and Market Streets and also Circle Street.

RECENT PATENTS.

In this department we shall print from time to time brief descriptive notes of recent patented inventions relating to roads, streets, drainage, bridges and wheeled vehicles.



Detail of Pick-beam.



Excavator at Work.

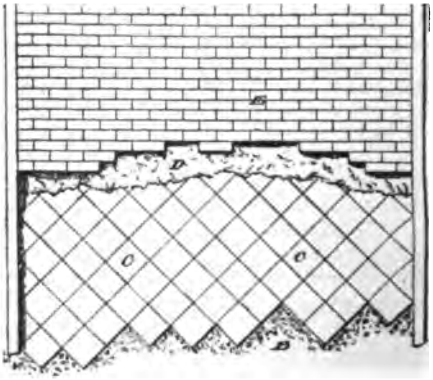
TRENCH EXCAVATOR

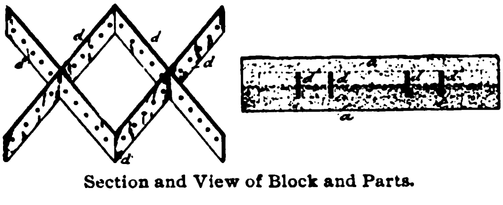
having the frame mounted on wheels and adapted to straddle the trench, the pick-beam loosely secured above the frame, the pick and mechanism for operating the same, carried by the beam, the elevator loosely secured on the rear axle of the machine, and the bucket-chain, both pick-beam and elevator being capable of a vertical and lateral adjustment to bring the latter in proper position beneath the pick.

ARTHUR J. MASON,
Patentee,
Kansas City, Mo.

BRICK PAVEMENT.

A pavement composed of a suitable bed, a layer of square bricks laid flatwise diagonally across the street, a layer of cement filling the joints and covering the said layer, a layer of sand on the said cement, and an upper layer of bricks set on edge lengthwise across the street on said sand and cement.—JOHN R. HALDEMAN, Patentee, Normal, Ill.





Section and View of Block and Parts.

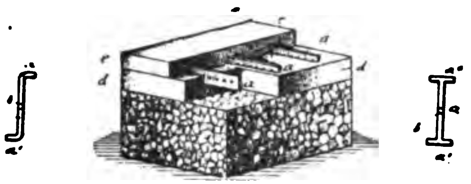
ARTIFICIAL STONE PAVING-BLOCK.

An artificial stone paving-block having embedded therein metallic V-shaped binder-bars or plates set on edge and provided with interlocking recesses at or near their end centres, said V-shaped bars being disposed in opposite direction and provided with openings along the centre thereof, so that the material forming the block flows through said openings and unites on both sides of the binder-bars.—FRANKLIN HAINES, Patentee, Yonkers, N. Y.

ARTIFICIAL STONE PAVING-BLOCK.

Formed of two layers or courses having embedded therein metallic binder-bars or plates set on edge and provided with openings in the body along the middle thereof, the material of the adjacent layers uniting at the openings and flowing therethrough, and with flanges at the upper and lower edges, said binder-bars extending from the base-layer into the top layer or course of the block.

An artificial stone paving-block formed of two layers or courses, having embedded therein metallic binder-bars or plates set on edge and provided with interlocking slots at or near the centre of said bars and with openings along the middle thereof, the material forming the pavement uniting at said openings and flowing therethrough.—**FRANKLIN HAINES**, Patentee, Yonkers, N. Y.

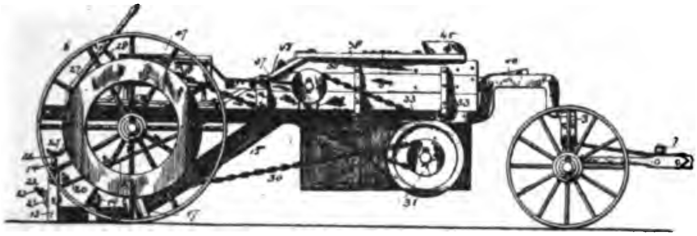


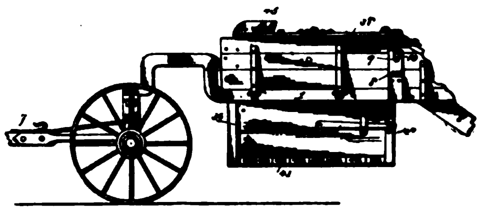
Block and Binder Bars.

STREET-SWEEPING MACHINE.

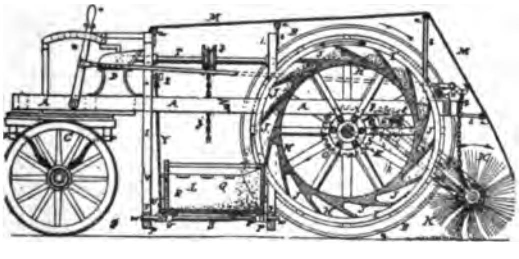
The combination, in a street sweeping machine, of the rotating drum having peripheral pockets, the collecting-trough located in front of said drum, the flat spring upon which the rear of the trough rests, the crank-arbor carrying the rear portion of the trough and journaled in bearings in the frame, the roller upon which the front portion of the trough rests and is adapted to move, the hinged door, latch-hook, and engaging-stud, and the elevating-rope and hand-crank, whereby the door is opened and the trough raised and moved forward.

In a street-sweeping machine, the combination, with the frame and supporting-wheels, the conveyor, and means for operating the same, of the dust-receptacle having an opening at its rear end to receive the upper end of the conveyor, a hinged side door, and the bottom consisting of a series of removable transverse bars having their outer ends cut away or recessed, forming shoulders against which the door abuts when closed and locked, whereby removal of said bars is prevented.—**SERENO H. RATHBURN**, Patentee, Stanberry, Mo.

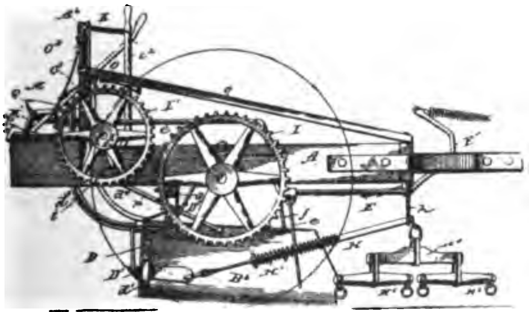




Side View of Machine and Collecting Trough.



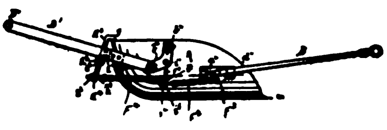
Longitudinal Section of Machine.



Side View of Scraper.

WHEELED SCRAPER.

In a scraper, the combination, with the frame, ground-wheels, and the vertically-movable scraper-bowl, of the spring for elevating the same, connections between the scraper-bowl and ground-wheel for lowering the same against the tension of said spring and the clutch interposed in said connections, whereby the bowl may be permitted to return to an elevated position under the influence of the spring.—**CHARLES RATH**, Patentee, Mobeetie, Texas.



Side View of Scraper.

EARTH-SCRAPER.

In an earth-scraper, the scoop having the draft-bail pivoted thereto at its forward end, a handle-bail pivoted to the side of the scoop near its rear, cross stop-bar connecting the sides of said handle-bail and adapted to rest beneath the rear upper portion of the scoop to limit the upward motion of the handle-bail, and a catch pivoted to said cross stop-bar and adapted to lock said stop-bar and handle-bail to said scoop to prevent the downward movement of the handle-bail.—**JULIUS D. BRAINARD**, Patentee, St. Paul, Minn.

BORROWED WIT

HOW HE FOOLED THEM.

They were takin' a subscription for a paper in the town,
And the editor, as usual, was on hand,
And he said, if they meant business, they must do the thing up brown,
And they'd have the best newspaper in the land.

They hadn't any money, but one man—he give a steer,
And one chipped in a mule that saw the war;
Another give a cow that had been dyin for a year,
And didn't know what she was livin' for.

Hogs, turkeys, cows and chickens—they was given on the spot,
'Till the ground with all the animals was hid;
But the editor a-smilin' an' a-gatherin' up the lot,
Said: "I guess I'll go to farmin'?" An' he did.
—*Atlanta Constitution.*

A MAN had a donkey for sale, and, hearing that a friend wanted to buy one, he sent him the following, written on a postal card: "Dear D— If you are looking for an A1 donkey, don't forget me. Yours, etc., F—." —*London Tit-Bits.*

THE COW AIN'T IN IT.

Miss M.—Now, Hamilton, you read the lesson to me first, and then tell me with the book closed what you read.

Hamilton (reading)—' See the cow. Can the cow run? Can the cow run as swift as the horse? No, the horse runs more swiftly than the cow." (Closing up the book to tell what he has read)—Git onto the cow. Kin her jiblets run? Betcher life she can run. Kin the cow do up the horse a-runnin'? Naw, the cow ain't in it wid de horse.—*The Rider and Driver.*

THE HOSTESS—How noble it was of you to dance twice with Polly Parker! I have always said that you boys ought to pay some attention to the plain and uninteresting girls

The Devoted Youth—Yes; you know she and I are engaged.

SOUND SLEEPING.

S.—It is very singular, isn't it, that a man sleeps the soundest the night before he is hanged.

T.—What's the matter with his sleeping sound the night after he is hanged?

AN old dame riding home along Cockenzie Sands, pretty hilarious, fell off the pillion, and her husband, being in good order also, did not miss her till he came to Prestonpans. He instantly returned with some neighbors, and found the good woman seated amidst the advancing tide, which had begun to rise, with her lips ejaculating: ' Nae ae drap mair, ah thank ye kindly."

"THEY tell me you have learned to count, Robbie," said a pious old lady to her little grandson who was paying her a visit out in the country. "'Course I can," answered Robbie; "listen: One, two, three, four, five, six——' "That's right,' said the old lady encouragingly, "go on ' Seven, eight, nine, ten, jack, queen, king!"—*Hartford Post.*

WHAT'S IN A VOICE.

On one occasion Chief Justice May was trying a man for robbery and assault in Galway and sentenced him very properly, to a severe term of imprisonment There were two Galway gentlemen in court—let us call them Burke and Blake. ' Burke," called out Blake, in the silence that succeeded the sentence. "Here, sir," said Burke, taken off his guard. "Burke," repeated Blake's voice, solemnly, ' let that be a lesson to you." The judge sat unconscious on the bench while this moral warning was delivered in an excellent imitation of his tones, amid the laughter of the court. —*Pall Mall Budget.*

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Sept. 13, 1892.

Pope Mfg. Co.

I have just ended a tour of 1521 miles made upon the "Century" purchased of you July 14th, and it is but due you that I should volunteer my testimony as to its merits. While I have found the roads generally superior to those of America, my route has taken me over some of the most trying roads to be found anywhere, I think, including the rough, stony roads of the Scottish Highlands and the Cheviots, over the Carter Fell, the horribly paved roads of Belgium, and portions of northern France, and miles of newly laid flint metal in portions of western England. The tires have given me absolutely no trouble in anyway whatever, nor required the slightest attention further than to be deflated or inflated as the condition of the road surface would suggest, and the machine itself has in no particular required repair and is now in as fine running condition as though new. I am certainly more than satisfied, particularly so because of having observed so much annoyance and expense caused by the English tires.

I am, yours truly,

FRANK C. BISSELL, of Westford, N. Y.

* * *

The Century Columbia has met with the greatest favor and success attained by any bicycle yet built. The above praise—a fair sample of what we are daily getting—is fully merited by this splendid machine.

More than passing thought should be given to the care taken to have the hardness of the tire suited to the surface of the road—a good point.

A fine instrument of any kind is entitled to fair and intelligent treatment, and its usefulness and length of service will be materially affected by it.

POPE MFG. CO.,

BOSTON. NEW YORK. CHICAGO. HARTFORD.

ILLINOIS NUMBER

GOOD ROADS

"THE ROAD IS THAT PHYSICAL SIGN OR SYMBOL BY WHICH YOU WILL UNDERSTAND ANY AGE OR PEOPLE. IF THEY HAVE NO ROADS THEY ARE SAVAGES FOR THE ROAD IS THE CREATION OF MAN AND A TYPE OF CIVILIZED SOCIETY"

VOL. 2. DECEMBER, 1892. NO. 6.

HARVARD COLLEGE
JAN 13 1893
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An illustrated monthly magazine devoted to the improvement of the public roads and streets

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Hon. John P. Altgeld,
Governor-Elect of Illinois.

ISAAC B. POTTER
Managing Editor
PUBLICATION OFFICE
POTTER BUILDING NEW YORK

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GOOD ROADS.

Vol. 2. December, 1892. No. 6.

GOOD ROADS FOR ILLINOIS.

By Hon. John P. Altgeld, Governor-Elect.

THE question of good roads is one of the most important that now confronts the farmers of Illinois, and it relates to a class of internal improvement that the state will have to take hold of with a resolute spirit. The time has come when a citizen of Illinois should be able to drive from one end of his state to the other with a team at all times of the year. We have astounded the world in the building of great cities, great railroads, great shops and great factories; we have built up a splendid agriculture, and have pushed the development of our wonderful resources, and the attention as well as the energies of the people have been directed towards these ends; but we find that nothing has been done toward the making of

"THERE ARE MONTHS IN EVERY YEAR IN WHICH IT IS IMPOSSIBLE FOR THE FARMER OR THE MERCHANT TO DRIVE HIS TEAM TWENTY-FIVE MILES WITH EVEN HALF A LOAD."

HON. JOHN P. ALTGELD, GOVERNOR-ELECT OF ILLINOIS.

highways that shall be passable the year round, consequently there are months in every year in which it is impossible for the farmer or the merchant to drive his. team twenty-five miles with even half a load; in short, we have made no practical progress toward the improvement of our roads. Both the inconvenience and the actual loss resulting from this, falls mostly upon the farmer, though to some extent it is shared by the whole community. As a result of impassable roads, the farmer is frequently prevented from taking his grain and other products to market at a time when they would bring the best prices, while at other times the railroads, being driven beyond their capacity by the glutted freight and store houses when the roads are good enough to permit of the grain and other products being brought to market, are liable to be short of cars, and having to do the whole business in a kind of irregular way, will keep the freight charges up to a higher point than would be necessary if the country roads were good enough to insure a more uniform supply, and thus give the railroads something like an even business. With better wagon roads less rolling stock would then be required to fill the demands of the carrying trade, and, upon the whole, the railroads would be subject to less expense. Then again, attempting to team in the mud wears out, not only the wagon and the harness, but tends to exhaust and break down the horses; so that one day's teaming in the deep mud will sometimes cause more loss to a farmer in these respects than a whole

CHICAGO MUD. WAGONS ABANDONED AT OGDEN AVE. AND 22d STREET, APRIL 6, 1891.
(By courtesy of *Century Magazine.*)

month's teaming on good roads. Again the people in the cities and the villages are subject to inconvenience, and sometimes to extra expense, because, owing to impassable roads, produce cannot be brought to market. In view of these considerations, and for other excellent reasons which might be multiplied to great length, the time has come when a great and proud state like that of Illinois, greater and grander than any of the ancient empires of the earth, and one of the richest, most powerful and most wonderful states in the civilized world of to-day, should have highways from one end of her borders to the other, which can be travelled with comfort every day of the year. Years ago the state had something like an internal improvement system. I believe the greater part of the Chicago & Alton Railroad was built by the state. Other great enterprises that were calculated to develop the resources of the state, to bind the people together and give them rapid means of transportation, were aided and carried out by the patronage of the state government. The time seems now to have come when the state must again take up this subject of internal improvement, especially in so far as

"THE PEOPLE IN CITIES AND VILLAGES ARE SUBJECT TO INCONVENIENCE, AND SOMETIMES TO EXTRA EXPENSE."

it relates to the making of good roads, and it should be done upon a comprehensive system, so as to insure something like uniformity from one end of the state to the other; otherwise we might have cases where one county or perhaps one township would build a good road and then the adjoining township or county would not, and thus a kind of fragmentary improvement would result. As to how the expense should be borne is a matter of detail that will require a good deal of examination. It is possible that in most cases a part of the expense could be levied in the form of an assessment upon land along the route, that derived some *special* benefit from the road, and that another part of the expense could be paid by the county, and it is possible and perhaps proper that in some instances the state should contribute something. I will not attempt to go into the details of this, but when once taken hold of in a resolute way, the problem of expense can be readily solved.

As to the material with which to build improved roads, some difference of opinion exists. Some engineers claim that a good quality of clay can be found at no great depth all over the state. Assuming this to be true, this clay might be dug up at different points along the road where it is needed and burned right there into hard, irregular fragments; that is, instead of attempting to mould it into bricks, or regularly shaped blocks, it could be so burned in small, irregularly shaped chunks, as to become as hard as stone, and thus could be used to make a "macadamized" road. It is claimed for this system that clay thus burnt would make even a better road than stone, and that by reason of the small cost of hauling, the road could be made without very great expense. Other engineers advocate the making of macadamized roads out of crushed stone and claim that a road-bed wide enough to provide for the passage of four teams abreast could be built at a cost ranging from $2,500 to $3,000 a mile. They also urge that, inasmuch as the state owns large quarries, the state convicts, instead of being "hired out" at a few cents a day to work for contractors who thus enhance their own private fortunes, should be set to work breaking stone to be shipped to various points and used in building roads. This plan has a great deal to recommend it, and, I must say, strikes me favorably. I do not say that all convicts should be set at this work, but that a very large proportion of them should be. It is further urged in favor of this plan, that as the railroads would get their freight to carry with more regularity after good roads were built and would thus be able to operate their roads more cheaply, they could well afford to make very reasonable rates for the haulage of this crushed stone from the penitentiary to points near where it may be needed on the road. Again, some gentlemen who have given this subject much consideration, have arrived at the conclusion that, as the public roads now generally run on section lines and make right angles around quarter sections of land, while the railroads generally run direct from one point to another, so that the distance by railroad between towns is generally considerably less than it is by wagon road, and as the railroads generally run to what may be called "centres," it would be a good plan when constructing new roads to follow the railroad so far as was practicable; that in this way the distance would be shortened, that the new roads in all cases would then lead direct to central points and that the material for making the roads could in this way be hauled on the cars right along from place to place and left at the exact spot where needed, thus saving the hauling of the material from the cars to points more or less distant, as would be necessary in the improvement of the roads already located. There is, of course, the objection to this plan that in many instances there would be danger of horses becoming frightened at the passing trains; but all these questions are matters of detail. It may be that, when the subject is once taken hold of in earnest, an entirely new plan can be devised, differing from anything that has yet been discussed, and leading to a satisfactory solution of the whole problem. However this may be, the time has about come for the mud road to go.

This copy of GOOD ROADS has a special value to the Illinois reader. If you do not care to preserve it for your own use, send it to Chief Consul F. W. Gerould, 108 Madison St., Chicago, Illinois. Mr. Gerould will use it where it will help to advance the work.

HARD FACTS AND PRACTICAL POINTS.

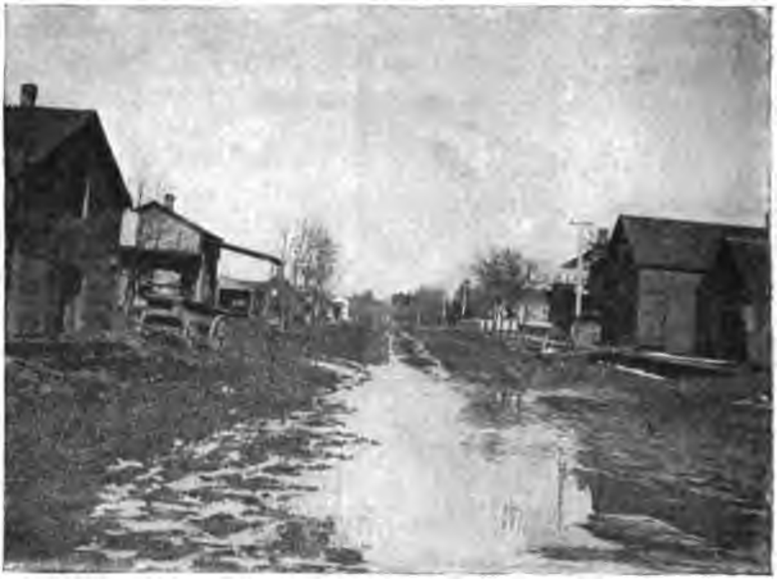
By D. R. Sperry, of Batavia.

All over the State of Illinois the lack of good roads, roads of the kind which are in fair condition all the year round, is seriously felt. It is not too much to say that the farmers and trades-people in the smaller towns annually suffer a money loss through the impossibility of traveling on our average country roads at certain seasons of the year. A mint of money has been expended in the making of roads in Illinois, but what is there to show for it? For the amount spent the results are ludicrously small and inadequate. There are large neighborhoods where not one rod exists that is even in tolerable condition. This is the case in every section of the state, but more particularly in the central and southern portions. There is hardly anything for which the people of the state have paid so much and got so little. Illinois is four hundred miles long, and there are thousands of miles of so-called roads in it, running in all directions, but if there are two hundred miles of good roads altogether that is certainly a fair estimate. What is to blame for this state of affairs? Nothing but our haphazard fashion of building roads. As long as we persist in our present system we shall never have any goods roads in this state. Deplorable ignorance of even the first principles of road building—for this is a science which, like any other, needs to be studied and learned—together with the unwillingness of the average rural citizen to sacrifice his time and money for the common good are responsible for the execrable condition of our roads.

D. R. SPERRY.

FARMERS ARE TO BLAME.

Many of these roads are perfect morasses or swamps nine months out of the twelve. The overseer of roads will make the road so that the lowest part of it will be in the centre. There being no proper drainage, the water, snow and liquid mud will all run toward the centre of the road and stay there until the beneficent rays of the sun and the raw winds of spring dry the pool. This state of things may be seen even at this late season in every part of the state, not excepting the immediate neighborhood of Chicago. The roads around Austin, a suburb of Chicago, but seven miles from the court house, are just as swampy and undrained as those two or three hundred miles farther south. The rural population has become so accustomed to look upon road building or repairing as a disagreeable, profitless duty that every one of the men who are engaged in the task for a time rushes and hurries through his work, with never a thought for the future, only intent on getting the thankless job off his hands. These same people will afterwards



"THERE BEING NO PROPER DRAINAGE, THE WATER, SNOW AND LIQUID MUD WILL ALL RUN TOWARD THE CENTRE OF THE ROAD AND STAY THERE."

View of important road within corporate limits of Belvidere, Illinois. From photograph taken March 23d, 1892.

curse the poor roads they themselves have made when they have to travel over them. Then, too, there is much corruption practiced in the application of our existing regulations for building or repairing roads. The roadmaster will excuse this one and that one from his share of the work on payment of one dollar or fifty cents, half of which sums will, in all likelihood, never find its way out of his own pocket. These facts are notorious, and are deplored by every good citizen in the state. Nobody, however, seems to know a remedy for the evil. And even in localities where an earnest, honest effort has been made to build and maintain good roads, the faulty system plays havoc with the best intentions.

"THE MUD WAS SO BAD AS TO FORCE THE GROCERS TO GET OUT THEIR HAND CARTS AND DELIVER THEIR GOODS TO CUSTOMERS IN THAT WAY."
Photographic view of abandoned "delivery wagon" within city limits of Chicago, taken in Spring of 1892.

KANE COUNTY'S EXPERIENCE.

A few years ago, for instance, the men of Kane County came together and, by private contributions, built their first three and one-half miles of decent country roads. Since then hundreds of comparatively good roads have been constructed in that county. These are gravel roads, and though limestone is not exactly the best material for fine roadbeds, requiring especially good drainage to make it last, the roads thus built are superior to most of the country roads in Illinois. But with all the expenditure of money and trouble that the citizens of Kane County incurred, nothing really creditable was done—due to the fact that there was nobody in the county who really had a competent knowledge of road building. The central part of the state, though, is much worse off in this respect than is the northern portion, owing to the absence of good material for the building of roads. The rich alluvial soil of these low prairie lands yields no stones or other material suitable for the making of durable roads. The tile draining of roads is the proposed remedy. This plan, though feasible and effective when properly carried out, needs competent men for its execution, so as to lay out good roads and to see to it that the water will be carried off speedily. It is the great lack of competent men that interferes sadly with improvements needed and planned. And this remark applies to the whole state. Tile draining, as a medium for good roads, will answer the purpose admirably, south as well as north, so long as properly done. This has been seen all over central Illinois wherever there is a flat prairie.

VITRIFIED BRICK FOR ROADS.

The discovery of vitrified brick, so largely used of late in and around Peoria, Jacksonville, Galesburg, Springfield, and other towns, has done much for road building. This vitrified brick, excellent in quality and now made very strong and thick, is manufactured in large quantities in a number of rural districts of Illinois. A few years ago, at certain seasons, the mud in such cities as Springfield, for example, was so bad as to force the grocers to get out their hand carts and deliver goods to their customers in that way. Horses were not able to draw the wagon to get through the slough in the streets. It was similar in Jacksonville and other towns. Tile draining and vitrified brick have begun to make a great change. As to the benefits derivable from good country roads all farmers are agreed. Farm land lying along good roads quickly rises in value. Go to Maryland, for instance, and you will find that the farms on the pike roads leading to Baltimore, Frederick and other towns are worth $10 an acre more than the land lying a mile or two off. A few weeks ago, when wheat was so high in Chicago, how much do you suppose it would have been worth to our Illinois farmers if they had had good roads to travel on so as to shove their wheat quickly into town? As it is now the Illinois farmer is almost isolated from the rest of the world three months in the year. Then look at the great benefit good roads would confer on our school-going youth in the state, enabling them to attend regularly instead of forcing them to suspend school attendance for weeks at a time during the impassable stages of our roads. And take all this in connection with the enormous sums that are practically wasted in this state on road building.

GREAT WASTE OF MONEY.

One township in the northern part of the state containing a population of 7,000 has spent during the past ten years about $40,000 on roads. The two and a quarter millions of our farming population in Illinois have certainly laid out as much as $10,000,000 for the same purpose during that period. And the result of it all has been in the main nothing but a series of roads that are roads only in name, or at least roads but a few months in the year. For the wet season rain and snow combined invariably destroy all the work done on them, rendering those roads impassable puddles of mud. A thorough reform is required to change all this. A capable state engineer, and under him county or district engineers or roadmasters—persons who are thoroughly grounded in the art of constructing good roads—are needed. The state ought to be subdivided for this purpose, with headquarters for the main divisions at Chicago, Quincy, Springfield, Rock Island, Cairo, etc. This, however, as other matters would be made dependent on the verdict of the surveying engineers, who would first have to go all over the ground. The main divisions should again be subdivided. It would then be made compulsory for every community to either construct or maintain good roads as a public necessity for the welfare and prosperity of the whole state, doing away with the quasi voluntary system now in vogue. These engineers, of course, should have charge of the roads, construction and maintenance. Then only would we obtain good results in the matter of our road building. A sweeping reform, however, if carried out at state cost, would entail an enormous expense, and as the average citizen would be unwilling to voluntarily increase the burdens of his taxes, the employment of convict labor for the purpose of road building is advocated. And it is just now a very good time to say something in strong advocacy of this plan.

SHORT LESSONS ON TARIFF.

A convict by his crime has forfeited his time and labor to the state. Under the system hitherto pursued the convict has been a standing injury to the community by reason of the character of his labor. A man outside the prison bars, the reputable citizen, is taxed $2 for his lumber, $1 per ton for his coal, taxed for his salt, and taxed for pretty nearly every necessary of life, clothes and all, under the beautiful system of a so-called protecting home industries. But the same government permits convict labor to enter into competition with free labor in an endless series of occupations and industries. Especially is this

A VISION OF CONTRAST.

View of a hard (gravel) road; from photograph taken March, 1892. A few years ago this road was as bad as the prairie roads of Illinois. The engineer drained it, and the drainage dried it and keeps it dry. He rolled the earth bottom and the gravel top, and the rolling made the road firm and hard and keeps it so. The same teams that could not haul 1,800 pounds over this road before improvement, now haul three tons at all times of the year.

the case in the smaller industries. Not a few of them have been ruined by convict labor competition, and in all of them this competition has at least had an injurious effect. Convict labor in Nashville, Tenn., and Louisville, Ky., has killed the wagon-making industry in these sections of the country. No less than 20,000 wagons were made last year in the Nashville prison. In Grand Rapids, Mich., manufacturers have slowly built up a great industry in fine, substantial household furniture until they have made a thriving trade of it. Now they are going to make the same class of furniture in the state penitentiary of Michigan, with the prospect of destroying the industry for free labor. Look at the shoe business. A few years ago we were beating the world in good, cheap boots and shoes, and were shipping largely to foreign countries. Prison labor has ruined that industry. Shirts are made in state's prison to injure the poor working girls. Cigars are manufactured in state's prison to further depress that industry and reduce honest labor's pay. It is similar with the making of hats, caps and stockings and a number of other small industries. In our own state the facts are too well known to need repetition here. In saddler's ware and in shoes, in marble and stone cutting and in other industries, the injury done to free skilled labor by the convict labor of Joliet and Chester is still remembered by our artisans and workmen. And it was because of the deep and lasting wrong wrought by this unfair competition with the skilled laborers of our towns and cities that the legislature two years ago took decisive steps to right things. The constitution of the state was changed so as to abolish contract labor in our state's prison. But nothing was substituted in place of it. Now there exists a plan on the part of the former contractors to sell their plants to the state at good round, fat prices. If this is done it will delay any wise legislation in regard to the proper utilization of convict labor for years to come.

CONVICT ROAD BUILDERS.

What is proposed by those who have no other aim in view but the good of the commonwealth, and who at the same time have a due appreciation of the facts entering into a consideration of the matter, is the employment of convicts for the building of our public roads and highways. In this way, without entering in any way into competition with private labor the state as a whole would be greatly benefitted. There would be, in round numbers, about two thousand convicts that could be employed all the year around for this purpose. The desperate criminals, of course, could not be put at road making in the open air. They would have to be used all the time in making brick, drain tile and vitrified brick. The use of these products, though, would be so large that their labor in this field could be almost illimitably utilized. Tiles could be used for culverts, and drain tile would keep the roads dry all the time, no matter what kind of weather. The use of drain tile in this respect is universally recognized by the farmers of this state. Its efficacy has been strikingly illustrated in Livingston County, where land, on account of its swampy character, was almost valueless a few years ago. Now, through the wholesale introduction of drain tile, the land in this county has acquired a high value. To make this drain tile, as well as the brick that may be used in building roads, a large number of convicts could be profitably employed all the year round. All brick made in our state prisons should be plainly stamped "Convict labor," and should only be sold for public roads and streets, and a penalty should be attached to any other use of it. Another measure required is the passage by our state legislature of a resolution asking Congress to adopt a law forbidding the exportation of convict-made goods outside the limits of the state in which they are made.

The penalty should be confiscation of the goods. For experience has demonstrated the fact that no matter what wise legislation a state makes as to convict labor all its efficiency may be destroyed by the convict labor of another state. The bulk of the convicts serving time in our state penal institutions would, of course, attend to the continual building and repairing of roads all over the state. During the cold season, when the weather would be too severe for outdoor labor in every part of the state except in "Egypt," these convicts could be made to help in manufacturing the material needed in road building and there would be work enough for all of them. Of course, they would have to be under strict surveillance, as they are at present, and their work would be carried on at the direction and supervision of the state engineers and of the road overseers.

It would also take time, no doubt, and experience to accomplish much in the line of road building. Competent men, men who have studied the roads of such countries as England and Germany and are conversant with the most effective methods of construction would have to be found. And even their acquired knowledge would have to be modified to be in consonance with the different conditions existing in Illinois. But those conditions could all be easily complied with, and our state would then get what it now lacks almost completely—good, solid roads. That deficiency supplied, the wealth of the state as a whole would be immeasurably increased. The labor of our convicts would become indeed a blessing and benefit to the state, instead of being, as in the past, a curse and detriment, or of being, as at present, a conundrum, which the present legislature is in vain trying to solve.

AN IMPROVED RACE-TRACK.

It has often been a matter of wonder why the ordinary race-track is permitted to be dusty, or muddy, as the weather may be. Of course the best speed cannot be obtained in either case. We are therefore pleased to note an improvement introduced at Narragansett Park this year.

During the past six months the experiment of mixing pulverized potter's clay with fine mineral sand has proved successful. Fine sandy loam was distributed over the old track, and about 600 tons of potter's clay from Nayatt Point, down Narragansett Bay, were dried, pulverized, and mixed with the loam. The clay was dusted on the track forty tons at a time, and then gradually harrowed in. After this the track was puddled and then bushed. When dried out it was again harrowed and leveled with a track machine. The mile stretch is now as smooth as a billiard table, and as firm and elastic as an India-rubber track would be. Experienced drivers who have tried the new surface pronounce it the fastest track in the east, and equal to any in this country.

The keeping of a track in fine order is said to be too expensive for most racing associations, but we are led to believe that there would be economy and profit found in a fine, level, clean track.—*Carriage World.*

WHAT A WHEEL HAS DONE.

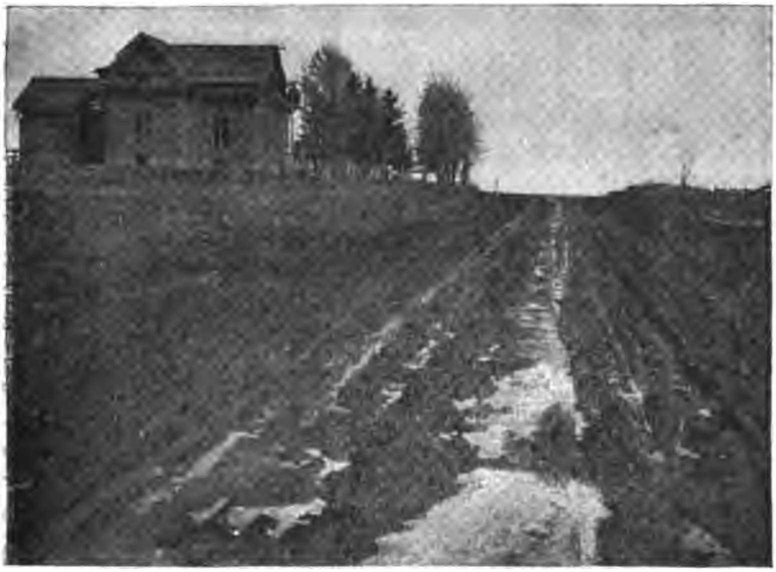
By S. Thornton K. Prime,

Editor of "Prime's Crop Bulletin," and Secretary of Executive Committee, Illinois Highway Improvement Association.

THE object of country roads is for the revolution of wheels. When we look back over the last hundred years, their progress over these roads has been very slow. In fact, for fully six months out of twelve, obstructions of every kind have stood in their way, and continue to do so to a greater or less extent. It now seems very strange that what was once considered only as a toy, has, by the skill and mechanical genius of man been evolved, into a wheel which we call the bicycle. The revolution of this wheel, and the obstacles which it has been called upon to overcome, have put in motion an enthusiasm on this question of good roads, from one end of the country to the other, which, if it can be kept up with the same push, vim and vigor with which it has commenced, will, in the end, give us a system of good permanent roads for which generations yet unborn will rise up and call us blessed. In a journal like GOOD ROADS it seems to me useless to waste time or space in discussing the question any longer why our country roads are so bad, and what benefit will naturally arise from making them better. The need of the hour is for some practical plan of work suitable in the main for all states and something which will give us immediate relief. The organization of the National Road League in Chicago seems to me to be the move in the right direction—first, for the reason that the country has never before felt the

S. T. K. PRIME.

necessity for good roads as it does to-day; then, again, the almost universal sentiment of our people in every state is in favor of a change, and the time now seems ripe for it. Recent inquiries in Illinois from candidates from the Republican, Democratic, Prohibition and Labor parties have brought out these facts: First, that convict labor could and should be very largely utilized, first, in the preparation of material, and, secondly, in the utilizing of it where practicable upon our country roads. I also find a growing sentiment in favor of state aid and also that our laws should be so adjusted as to enable counties and townships to vote bonds for the building of public roads. We have not yet reached the question of national aid, but that will follow naturally. This country has had a practical illustration of what good roads can do for everyone, during the last three months, from the vast receipts of grain which have literally blocked up our great railways, filled our elevators until the railroad managers have cried "Hold, enough!" This grain which has been flooding the country recently was an accumulation of six months' reserves. At the time it ought to



"PRICES WERE HIGH, BUT THEY COULD NOT MOVE THEIR CROPS."
Photographic view of important country road in Boone Co., Illinois, taken in the Spring of 1892.

have been thrown upon the market, our roads were bad, farmers were backward with their work, prices were high, but they could not move their crops. They were obliged to hold them until this Fall and throw them upon the market at a range of prices so low that they hardly paid "cost of production." Permanent roads would always give the country a normal flow of grain. Prices would range more regularly and the general distribution of the wealth of the country would be calculated upon with a greater degree of certainty at times when it was most needed. It seems to me that the future problem of permanent country roads never looked as bright and encouraging as it does to-day. But it will require hard, persistent labor to bring it about successfully.

THE MUD AND THE MARKET.

The unfathomable mud in which the country roads are now locked is accountable for the present light receipts of hogs and to a less extent for the decreased arrivals of cattle. The number of the former received during the last week was the smallest since October, and the arrivals of the latter were 12,000 head below the average for the last eight weeks. The effect upon values has been to strengthen them. In the case of hogs not much advance was to be expected, the product still being relatively lower than the live animal, but a more marked advance in the price of beef cattle would seem to have been in accordance with the fitness of things, especially when the extremely low prices current a week ago are taken as a basis of calculation. The appreciation in cattle amounts to from fifteen to twenty cents per 100 lbs. and extends to all grades about equally. For some time past there has been a steady improvement in the quality of the cattle placed on sale. We are at last beginning to see the effects of abundant and cheap corn. No doubt the change will be even more noticeable as the weeks go by, for the open weather of the last month and the prevailing low prices have not had a tendency to hasten the marketing of half-fatted cattle, though it must be confessed supplies of that class have come forward with great freedom.

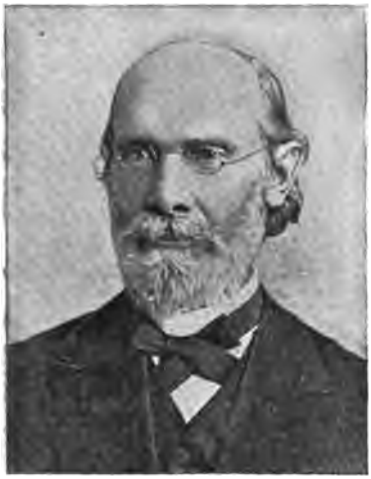
The situation in sheep continues favorable to producers, the demand developing satisfactory activity and prices showing great firmness. Within the week $6.25 was paid for sheep and $7 for lambs per 100 lbs.—*The Breeders' Gazette* (*Chicago*).

WHAT'S THE USE?

By Rev. M. K. Whittlesey, Ottawa, Ill.

It was a pleasant surprise, the sight of the July number of Good Roads. I now recall the impression—the feeling that this subject was "in the air;" a line here and there, a brief paragraph in this journal and in that, with increasing frequency, covering a greater space and in publications of very diverse character.

All is now plain. It is not that the exigencies of the case have prompted the movement so much as the magazine devoted to that subject.



REV. M. K. WHITTLESEY.

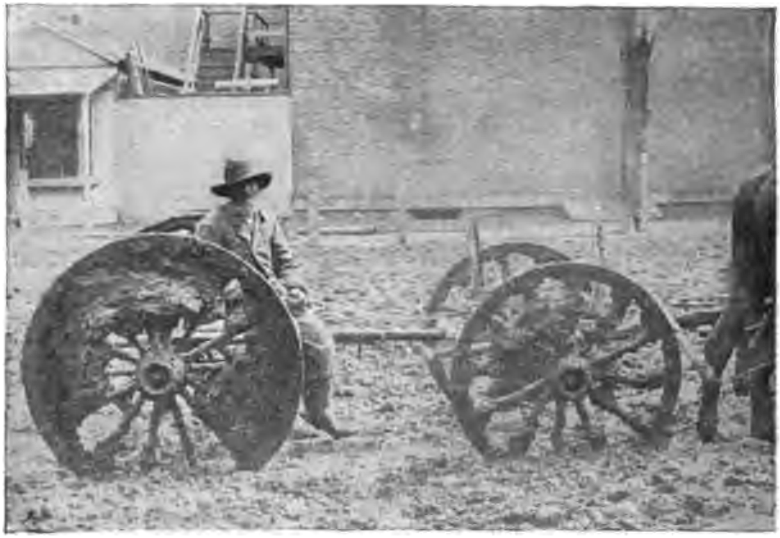
All hail to it and to the new era! And how it sets one thinking! With me it recalls those far away days when we worked out the highway tax. Happy days for the boy, when his work was estimated so high. Not so bad for the roads when the gravel-bed diffused itself over many a league.

Revisiting those scenes in the valley of the Connecticut, one never ceases to wonder, as the decades go, at the diminution of the bed and at the solidifying of the roads.

But Good Roads will recall to the scholar all he has read on the subject of Greek, of Carthagenian and Roman work of the "highway out of Egypt to Assyria," of which Isaiah spoke. He will picture in his imagination Cæsar's armies thundering along through Gaul and Spain and Britain on solid, scientifically built ways, long centuries ago, and marvel at the barbarism of the thousand years following, which overlooked and neglected these roads, so that up to the time of our Revolutionary War England had nothing better than a coach and six span of horses, and a fortnight's time, on the way from London to Edinburgh.

The reader in Illinois will recall his experience here if he has been a half century here, if he has been up and down and along and across this state, the not altogether pleasant but intimate relations he has sustained to the soil, in the days when there were sloughs and creeks and unbridged streams, swimming them in the saddle, with certain liabilities of rolling over and—a free bath.

As the farms multiplied and were fenced, and men went through "lanes" in the wet season, he will remember how they "gave it up and allowed that this country could never have roads." The idea was general that mud and water were insufficient for that end. The man in the saddle, with the "leggins" of that time, would be a relic of interest for the Columbian Exposition. Or the parson, to wit, myself, who drove twenty miles of an evening to be on hand for a marriage service early next morning. Three tremendous showers in quick succession were encountered, emphasizing Byron's



"THE NOT ALTOGETHER PLEASANT, BUT INTIMATE RELATIONS HE HAS SUSTAINED TO THE SOIL."

View of important road in Augusta, Illinois. From photograph by N. McDONALD, in Spring of 1892.

"Oh, night
And storm and darknings, ye are wondrous strong."

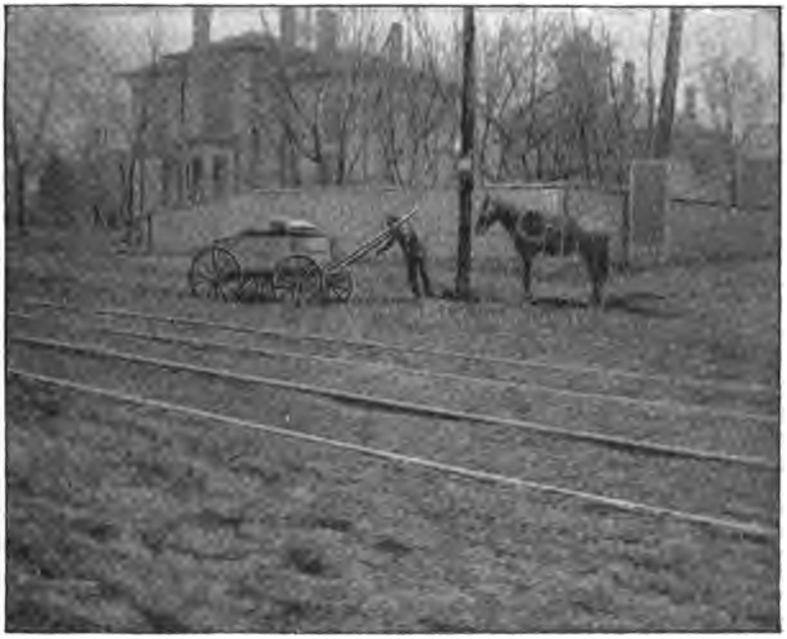
And Burns'

"And sic a nicht he taks the road in,
As ne'er poor sinner was abroad in.

* * * * *

That nicht a child might understan'
The deil had business on his han'."

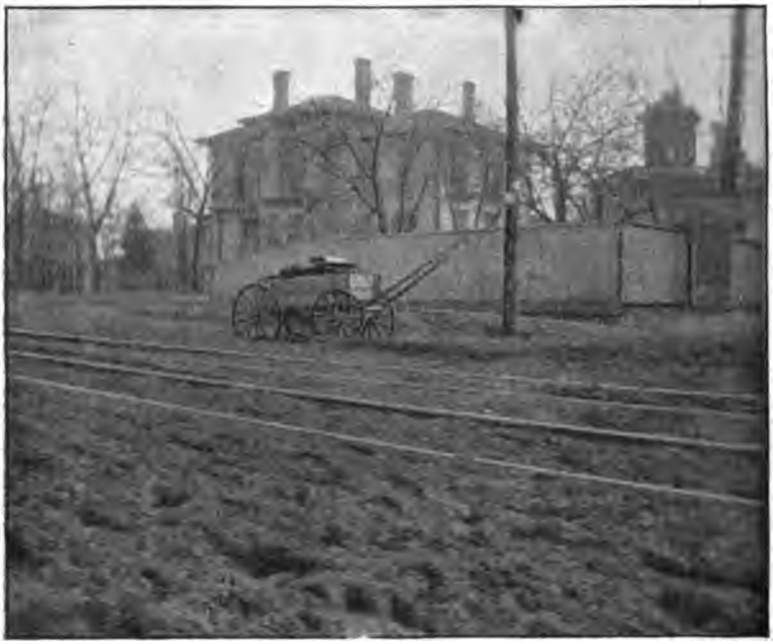
At the end of the drive, the horses, the broken harness and the carriage were "a sight." And the dominie, having in other than the poetic sense "taken the *road* in," his hat, his face and all his clothes plainly showed that he was "a stuck up man." From that day to this the matter of roads has been—on his mind.



GIVING IT UP.
Discouraged driver abandoning his loaded wagon in the streets of Danville, Illinois. From photograph taken March, 1892.

The despair of the early years is now gone. This magazine shows a way out. Illinois has the material in her own bosom for all her yet marvelous growth of the future. There are ridges of gravel not recognized formerly. There are myriad tons of boulders for the crusher; there are clay and coals for sewer pipe drainage, and vitrified brick and clay from furnaces and factory, for concrete. And there is the experience of near three thousand years, the best judgment of practical road-builders who have studied this subject, available through Good Roads to legislatures, supervisors, commissioners of highways, to civil engineers and to the all and sundry, the men who pay the taxes and who go by the road.

It may not be the wisest thing to assume that these are indifferent, and that the farmer is a sop-head, and the civil engineer doesn't know anything, and that money and work hitherto expended on roads, have been thrown away. An immense work has been done and at heavy cost, and in the day of small things. Hills have been cut down, drainage effected, bridges built and in the ratio of other improvements. But something more and better can yet be done.



THE ABANDONED LOAD.
Loaded wagon left stuck in the deep mud in the streets of Danville, Illinois.
From photograph taken March, 1892.

What is now needed is a different intelligence as to what is possible: What is the best thing in making the common road. How should the work be done, by the district, the town, the county or the state. How the public could well afford the expense, should share the cost, and what and how great and how widely diffused the advantages would be. These are matters for consideration, for discussion, in the public prints, in the neighborhood debating club, or in meetings of the Grange and of the Alliance.

The need of better roads in Illinois is that to which our thinking here should be given.

It concerns our pride not to be behind others. There is neither reason nor excuse for it. This is yet virgin soil, whose capabilities are proven sufficiently to indicate how great and varied they are. Fertility of ground. A climate favoring production. Let human ingenuity apply itself anew and in new methods, and what may we not see as product in agriculture, in cereals and in fruits.

The opened doors to the north and to the west, through which our population has steadily poured for a lifetime, are closing. The Government lands are well-nigh gone. Our coming millions are coming here to stay, if they can here find, as they can most surely find, the conditions of happy and successful lives. Money hitherto taken west to open new farms or to buy lands on speculation, can and will be invested here, and add immensely to our wealth, when it is apparent that life here is worth living, and that this world has nothing better.

Good roads will diminish the relative cost of production.

They will save great waste and loss. The wagon that goes to pieces in a few years by reason of Summer's mud and heat and Winter's hubs, the strain of rolling and plunging over the uneven surface, will last a lifetime and carry vastly more on a good way. Three horses will do the work of four and what would that item alone amount to yearly in the State of Illinois with its three hundred thousand horses? "I have lost" says my neighbor, "in a few years eight hundred dollars in work horses." How much in harness, he could not tell. Draft horses need not soon be worked out on good roads, where they may avoid strain, delays and consequent exposure of heat and cold. Time of transit is an element worthy of consideration, as respects both man and team.

Not far away are two farmers who in a single year threshed out, one three thousand, the other six thousand, bushels of oats, of their raising. Two miles only from market, what's a good road to them in marketing that grain? It is the unnecessary, profitless, hard work that makes the farmer short of funds, grow old prematurely and keep on the unremunerative and slack ways of cultivation. It is the bad road that knocks up and spoils in a little time the family carriage, and gives the "country look" to horses, harness and all, hat, bonnet and gloves. They cause breakage in transporting machinery, household furniture, the things carried; the mirror, the lamp, the bureau. They cause the delays in the night travel, exposure to storms, to sickness and death. The money and the labor thus lost are taken from improvements, from the comfort and luxuries of homes.

"SOCIAL INTERCOURSE" IN THE COUNTRY.
Going over to the next neighbor's to spend the day.

There is an economy in avoiding losses, leading to affluence, and making life's way easier and more agreeable. Good roads diminish the relative cost of production, by the facility in reaching the market. The multiplied railways bring to the producer here, the competition of far distant and cheaper farms, the much smaller investment against our costlier lands. But the trifling expense of time and money in reaching the market will make the conditions more nearly equal, and give us the advantage, with continual increase in the value of our holdings.

Our pride of character and position should lead us to seek the best things for the best place. We should be ashamed to be behind others; to have so rich a domain, and not know how to use it and make it as the garden of God. It should be our pride to make a good showing of what we have, in soil, in opportunity, in cultured and ennobled mind. It was, perhaps, in 1849, going into the country on horseback and floundering along through mud, going round the few farms, crossing the sloughs high up, I said, "Twenty years from now we will see here as splendid and comfortable homes as can be found anywhere. They will displace these hastily constructed, uncomfortable shanties." The time passes. The changes came. I spent a night in the very elegant house built by Governor Mattison in Springfield, the house John Wentworth, with effective sarcasm, named Scrip Villa. Its walls within were frescoed by Italian artists. Each room was like a picture gallery. This was one of the "homes" predicted. But in going to it and returning from it to the depot, we walked, because a hack could not go through the streets without being stalled. Some years after, a dray with a small load of wood was stalled in front of my residence on College Avenue, in Jacksonville. But these things are of the past. What then seemed well-nigh impossible has become real. Forty years have gone and we have the splendid house, the fine dwelling, the large barns and many a piece of gravelled roadway along the road I travelled. All improvements in a new country do not come at once. But let them hasten. Alertness, intensity, enterprise, enthusiasm, are characteristics of the American people. We who are at the heart of things should prove our kinship with the rest by pressing to the front in all that which has respect to the useful, the beautiful and the good. We are in a sightly place. Great names of immortal men fix attention on Illinois and on our way of doing things.

Horace Bushnell once said of the *Puritan Recorder* (Boston), that "It was not only behind the age, but behind all ages." Pride, profit, pleasure should put us far beyond such criticism, should bring incentive to manifestly useful and quickly remunerative improvements. Our roads are among the first things seen, and should be a token of our spirit, an index of what we are.

Good roads equalize the advantages of city and country preeminently in the social, the moral and the intellectual.

Take the matter of schools. What the town has, what the city has of high school, seminary or college, of superior advantage, the children's pony and road cart make it possible for them to enjoy from their country home the fresh morning air, the gleeful drive of a half hour; subserve their best interests of body and mind, give elasticity to flesh and spirit alike, and prepare a sinnewy race of boys and girls to cope with life's adversities.

The social intercourse qualifies them for happy co-operation and intermingling, interchange of visits, an equal social standing and association; secures them a common refinement of manners, common and strong friendships, noble emulations in a life career; the interweaving of business and marital relationships. The country becomes attractive to the citizen, the sweet fields, the happy birds, the embowered homes, the family pets, the rich fruits, the flowers, the garden, the vineyards, the rural populations and employments.

By good roads it is a small matter for the farmer to deposit his produce daily in the market, a few minutes' drive. The citizen's table is supplied with products from the dairy and the fields as fresh as his. Little children have their morning milk from the cow, to the neglect of pump and apothecary, and with considerable saving of funeral expenses. Multiplied attractions of prosperous, healthful homes, draw the citizen to the country. He can reach his place of business as soon with the horse, from his suburban residence, as on foot or by the car in town. The good road makes the town library, the evening lecture, available to the out of town population. It gives new interest and attractiveness to summer resorts near by. Riding, driving for pleasure become possible, affording a delightful airing and healthful exercise. As finer residences appear, new motives are brought to bear on roadside improvement. Unsightly weeds will be cleared away, and their seed-distributing offices end. Hedges will be subdued and kept in order. The appearance of the country lends a charm to the view, and gives increase of value to the acre.

"The cost of construction is feared." It is an unnecessary fear. An authority says, "Bad roads cost Illinois annually fifteen millions of dollars in marketing its produce." Cheap things, valueless improvements, human stupidities, are what such a State as Illinois has to fear, inertness, stagnation. Improvements out of doors, along the great highways, are evidence in things material and unmistakable of wakeful, stirring minds. They show a capacity to create wealth, and mind to enjoy it.

ILLINOIS ROADS AND ROAD MATERIALS.

By J. H. Burnham, C. E.

VERY few of those who are in favor of road improvements have given enough thought and study to the subject to be aware of the intricate complexity of the great problem it presents. Good roads are demanded by the public, and in a few cases the remedy is easy and simple; but when we broaden the demand so as to comprehend all roads, we are met by such a variety of road laws, county, city, village, road-district and township, and by such a difference in soil and topographical conditions, such a varied distribution of poverty and wealth, and such a woeful lack of good road material in many places, that the complexity and immensity of the problem grow upon the mind until it almost appears that a nearer approach to the subject cools enthusiasm and deadens effort. But if the problem is ever to be solved it must be studied in all of its aspects, and we must not shrink from the most careful and thorough investigation in order to arrive at a correct solution.

J. H. BURNHAM, C. E.

Let us therefore examine some of the conditions that exist in order to begin our preparation for a remedy, and if we learn enough to distrust any and all proposed plans for road improvement, and to confess that the great work is too large to be undertaken in two days, we shall at least discover that the two days have been well spent in study, and we may hope to advance the good work to a point where competent men can take it up and carry it forward to a successful end.

A careful business examination of nearly all the rivers, creeks and roads of Illinois for twenty-five years has made me fairly familiar with the soil and topography of that state. A business which constantly called into requisition the road and bridge law has so impressed the subject upon my mind that I believe my experience will be of some value in the proper study of this great subject.

For convenience I will divide Illinois into four districts. I will call the first the Southern district, comprising all that portion of the state south of the Ohio and Mississippi Railroad, which crosses the state from east St. Louis through Centralia to Vincennes. I will call all that territory lying between the Ohio and Mississippi Railroad and the Wabash Railroad, east of the Illinois River, the South Central district. This, therefore, is north of Centralia and south of Jacksonville, Springfield, Decatur and Danville. All north of the South Central district and east and southeast of the Illinois River, and on through Joliet to Chicago, I will call the Central district. The region west and northwest of the Illinois River is easily remembered as the Northwestern district.

SPRING MUD IN ILLINOIS.

View on an important Boone County road leading through one of the best farming districts in the state. This road is largely used by farmers, and is the route over which most of the building stone is hauled into Belvidere.

In the Southern district there are few improved roads, and in a large portion thereof, the soil is such that bad roads do not exist, as understood in Central Illinois. Most of the upland soil is of a white or yellow clay, and is, or has been, woodland, and will stand considerable wear before becoming impassable. River and creek bottoms, and a few rich and deep soils are the exceptions, and thus conditions exist under which dirt roads are more tolerable than elsewhere in Illinois.

A portion of this region, the southeastern, lying toward the Ohio and Wabash Rivers, is quite hilly, and in places the soil washes badly with the rain. The fact that there is comparatively little taxable property in this district combines with other causes in lessening the demand for good roads and decreases the probability of the active assistance of Southern Illinois, although even here may be found localities fully alive to the need of road improvements and as enthusiastic and energetic as the best.

I believe the gravel road between Cairo and Mound City built by the city of Cairo, and that at Mound City, near the National Cemetery, constructed by the United States Government, furnish the best samples of gravel road to be found in the state.

FAMILIAR TO THE ILLINOIS TRAVELER OF OLD TIMES.

View on the old stage route from Chicago to Dubuque. Now a most important farm road in Boone County. From photograph taken in June, 1892.

The famous rock and turnpike roads of Monroe and St. Clair Counties are equal to any in the west, and a few other pieces of hard road may be met with, as at Jonesboro and Anna. I believe Southern Illinois will co-operate to the extent of its ability in the construction of good roads, but in any comprehensive and successful plan of state road improvements, it must acknowledge a financial inability to keep pace with the state at large, and must recognize that owing to the conditions of soil, its need of such improvements is not pressing enough to demand expenditures equal to the wants of other districts.

In the South Central district, at its southern portion, in Fayette, Effingham, Clay, Jasper, Richmond, Lawrence, Crawford, Cumberland, and a few other counties, we find existing, conditions very much like those we have been examining, both as to soil, distribution of wealth, and lack of road material, but in the western portion, particularly in Madison, Jersey, Green, Morgan, Macoupin, Sangamon, Macon, and most of the northern counties, we find a sticky, deep, rich, black, prairie soil generally prevailing, almost as bottomless as the worst in the state; though not averaging as bad as some we shall discover elsewhere, for two reasons: one, the large amount of timber or woodland, which will stand considerable wear and tear, and the other the fact that, with the exception of a few flat counties like Douglas and Moultrie, the land is often considerably rolling, and it is generally free from swamps.

"TOWNSHIP COMMISSIONERS ARE THE ROAD BUILDERS IN MOST OF OUR AGRICULTURAL REGIONS."

Every road and every picture shows the ridiculous inadequacy of the present system of Illinois road laws. This view is from a photograph of an important road in Northern Illinois, taken in June, 1892. It shows the result of misapplied work; it has neither grade nor drainage, and had been for weeks in this condition when this photograph was taken.

Road material can scarcely be found in most of this district, though I am glad to state that within the last few years, great improvements have been made at Paris in Edgar County, Charleston, Coles County, Decatur, Macon County, and other places. There is reason to believe gravel will be discovered in many other situations.

I have referred to the lack of wealth in the southern and eastern part of this South Central district, but the western and northern portions are among the wealthiest of the state, and it is probable that any good scheme of general road improvement will find a hearty response in the region under consideration.

Northwestern Illinois, comprising the region north and west of the Illinois River, is the most highly favored road district in the state. Along the beds of nearly all of the streams flowing west into the Mississippi River, or south and east into the Illinois River, may be found banks of gravel; much of it of a fine quality for road building, and gravel is also found in many of the prairie ridges. The soil is usually the rich, black, prairie variety, but underlaid with gravel or sand in many counties, or permeated with these ingredients, and with also rolling, that very little of the district can be classed among our worst, although the wide prairies are deep and sticky, and road material is often too distant to be readily accessible.

KNOWING THE RIGHT WAY *vs.* GUESSING THE WRONG WAY.
THE ENGINEER *vs.* THE ROAD COMMISSIONER.
View of permanent. smooth country road between Warwick and Leamington, England. From photograph by JNO. CARBUTT, of Wayne Junction, Philadelphia.

The sandy borders of Henderson, Mercer and Rock-Island, near the Mississippi, and the rich, deep bottoms of the rivers and creeks, are perhaps the most discouraging parts of the whole state for road improvement, but as a whole, considering the number of fine cities and villages, the wealth of the farmers, and more especially, the general distribution of road material, we may consider Northwestern Illinois as the most promising part of the state, in the line of future road improvement, and the good work is now being carried on at so many points that this magazine can scarcely give it any greater impetus.

Central Illinois, or that region which lies between the Wabash Railroad on the south, and the Illinois River on the north, prolonging the line of the latter through Joliet to Indiana, is a district needing the most careful consideration. Along the borders of the Illinois, from Hennepin to Morris and Joliet, and on the banks, or in the beds of the creeks flowing into the river; near the Vermilion and the Kankakee Rivers; near Danville, and in a few other places, as at Gibson City, may be found valuable veins of gravel, which are rapidly being utilized for road purposes, and at the rate road improvement is progressing, large areas will soon be well improved. This Central Illinois district contains large flat prairies utterly destitute of gravel underlaid by wet sub-soils difficult to drain, and far remote from gravel or anything in the line of what our road improvement friends are beginning to call "road metal." This region possesses smaller timber or woodland districts than other parts of the state, and may be called emphatically the place most needing the attention of friends of good roads.

ROAD IMPROVEMENT IN AMERICA.

View of Rhode Island macadam road, showing hard, smooth surface during season of melting snow in Spring of 1892. A few years ago this road was so muddy as to be for weeks at a time almost impassable. From photograph.

In spite of the drawbacks of poor roads, the farm lands of this beautiful and fertile district have been rapidly advancing in value of late years, until the aggregate wealth of Central Illinois, is now almost fabulous in amount, and there is little doubt that its real estate will cheerfully bear a heavy road tax, providing this tax is wisely and economically devoted to the building and maintaining of good roads.

This rapid review of the large State of Illinois is necessarily imperfect; but, as a rough outline, it will answer our present purpose, and teaches us that the condition of our roads or soils varies widely in the different portions of the state, and that the ability of our citizens to meet the cost of good roads varies quite as much as the condition of soils or topography, and this review prepares the way for a cursory examination of the different road laws under which the people of this state are now operating.

Any view of this subject must recognize the fact that one-third of our population, and more than one-half of our wealth, is situated in cities or incorporated villages. Many of the villages and nearly all of the cities are making the most praiseworthy and strenuous efforts to permanently pave their streets at the cost of the municipalities, largely supplemented by special or individual assessment on the property benefited.

Road improvement conventions can assist these municipalities little, except in the one item of a possible wiser expenditure of the large sums annually being invested in street pavements, and members of road conventions will make a sad mistake if they think that heavily taxed cities like Quincy, Peoria, or Springfield are willing to pay heavy taxes to assist farming communities to secure better roads. Some plan of state aid for improved roads may be devised by which a very small state tax may be collected from cities without resistance, and it is quite possible some system of light national aid may yet be carried out, so that there may be a general distribution of state and national taxes, but in my opinion we must rely mainly on a division of the cost of improved roads between the county, township and the landowner.

DISCARD THE USE OF THE WHIP.

It is a noticeable fact that the most successful drivers of trotting horses seldom use the whip. Even when hard-fought races are on and sensational finishes are made the extreme limit of speed is secured without the use of the lash. There is a lesson in this, not only for the drivers of trotting horses, but for those who handle any kind of horses. With the proper training a draft horse will reach the limit of his power and exert every muscle in his body under kind treatment as quickly as he will when abused with the whip. A horse that will respond to the request for his best effort in a kind way is one that can be depended upon under any and all circumstances. It is the fault of the driver in nine cases out of ten when the use of the whip is made necessary.—*National Stockman.*

THE ECONOMIC IMPORTANCE OF GOOD ROADS.

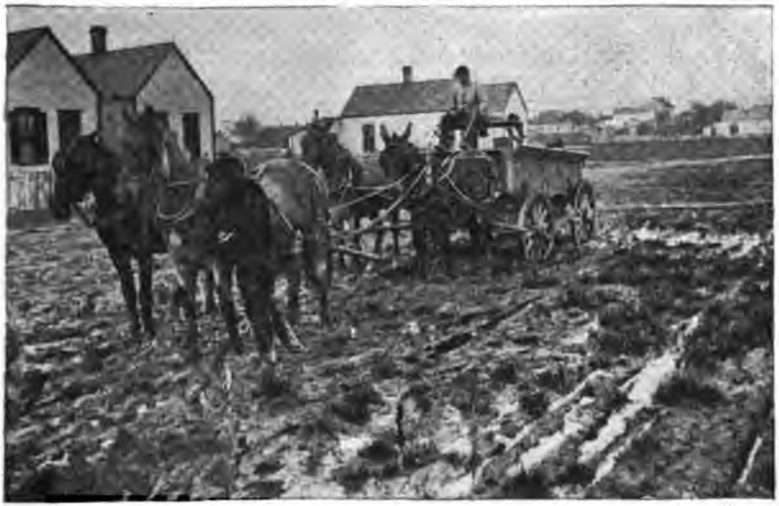
By Hon. John M. Stahl, Editor of "The Farmer's Call,"
Quincy, Ill.

TRANSPORTATION is a tax. Any economy in transportation is an actual gain. It increases the wealth or reduces the labor of society by so much. The political economists are undoubtedly right in saying that the value of an article may be increased by change of location; and it is equally true that the increase in the value is the same whether the change in location is effected by a certain expenditure of time and force or by an expenditure one-half as great.

HON. JOHN M. STAHL.

According to the Census Bureau, during the year ending June 30, 1890, the railways of the country moved 636,541,617 tons of freight, equivalent to moving one mile 68,727,223,146 tons. In the same year there were moved on the Great Lakes 53,424,432 tons of freight, equivalent to moving one mile 15,518,360,000 tons. Thus, during 1889 the freight traffic of our railways and lake boats was equivalent to moving one mile 84,245,583,146 tons. It is safe to say, considering the natural increase of our freight traffic and the unusually large crops of last year, that for this year on our railways and the Great Lakes will be done a freight business equivalent to moving 100,000,000,000 tons one mile. I have found it impossible to get complete statistics of the freight traffic on our canals. It is necessary to include a good, round figure on account of this. During the year ending June 30, 1890, the freight traffic on the Mississippi River and its tributaries reached 29,405,046 tons—more than one-half the freight movement of the Great Lakes. It is conservative to say that for 1892 the freight transportation within our own borders by rail and water in articles of our own production will reach 900,000,000 tons and be the equivalent of moving one mile 120,000,000,000 tons.

Basing my computations on a rail and water transportation of 900,000,000 tons, I reach the conclusion that this year there will be transported by wagon over the country highways of this country 500,000,000 tons of freight. Nearly one-half of this will be "farm products." I estimate that of the rail and waterway freight of the country, 25 per cent. is composed of farm products. It is true that of the freight moved on the Great Lakes (reference is had in all cases to the year ending June 30, 1890,) only 16.5 per cent. were made up of farm products; that of the freight handled by the railways of Pennsylvania, only 9 per cent. were agricultural products (64 per cent. being products of the mines); and that of the freight handled by Ohio railways, only 18.6 per cent. were farm products; but of the freight handled by Illinois railways 32.5 per cent., by Iowa railways 30.7 per cent., and by Kansas railways 33 per cent. were from the farm. The percentages of farm products were unusually low the year taken. Thus, of all the freight carried by Illinois railways during the preceding year, 38.3 per cent. were farm products. In other states farm products are a considerably higher percentage of the total freight.


"OUR WAGON TRANSPORTATION NOW COSTS A THOUSAND MILLION A YEAR."
Four horses and an empty wagon. Scene from photograph on western farm road (entering village), in Spring of 1892.

Much freight is transported by wagon over country highways in addition to farm products transported by rail. A very large part of our agricultural product, grains as well as meats

—perhaps more than one-half of our perishable vegetables, small fruits, poultry and dairy products—is brought to the consumer solely by horse-power. A very large proportion of the enormous quantities of fuel used in our villages, towns and cities is brought to the consumer without the intervention of the railways; and a very large part of the fuel used on the farm is hauled over country highways, especially in those western states where timber is scarce. Thus, of the total freight carried by the railways of Kansas, 25.5 per cent. were coal, and of the total freight carried by railways within Iowa 16 per cent. were coal. Of this a very large part is hauled from the railway station to the farm. Thirty-three per cent. of the freight of Illinois railways is product of the mines, and this product makes 48 per cent. of the total freight of Ohio railways. A good part of this is transported over country roads. If we yet consider the freight hauled from railway station to the farm in the form of manufactures, lumber (a large item), etc., it will appear plainly that it is conservative to estimate the 1892 wagon freight of this country at 500,000,000 tons.

VILLAGE SCENE IN A WESTERN STATE.
From photograph taken in Spring of 1892.

This will be transported over country highways an average distance of eight miles. Illinois is well supplied with railways—has a larger railway mileage than any other state in the union; yet even in Illinois farm products must be transported an average distance little less than eight miles. The annual wagon transportation of this country is equivalent to moving 4,000,000,000 tons one mile.

It costs 25 cents per ton per mile. When our dirt roads are fairly good 2,500 pounds is a fair load. If the farmer drives with this load fifteen miles and returns, it is a good day's work, although he returns with his wagon empty, as he will in nine cases out of ten. Here under favorable conditions transportation costs 15 cents per ton mile. Consider how often less than 2,500 pounds can be hauled; how often it is impossible to get through the mud with much more than the wagon itself; and it will appear that 25 cents per ton mile is not too high an average figure. Hence, our wagon transportation now costs $1,000,000,000 per year.

Gen. Gilmore conducted many careful, actual tests. Prof. Carson, another very high authority, says the results he has obtained from experiments agree with those stated by Gen. Gilmore, which are to the effect that the same horse power will draw on a gravel road 139 per cent. and on a macadam road 313 per cent. of the load it will draw on a *good* earth road. I have consulted quite a number of authorities and I find that they state that if our roads were *first-class earth* roads only, the same power would, on the average, draw at least three times as great a load as now. If at first blush this may seem an exaggeration, reflect how nearly impassable many of our highways are during half of the year; how very rarely, if ever, they are in really first-class condition. Prof. Sanborn states that while neither the best nor the worst of earth roads were available for his trials, he found that the difference in draft on the best and on the poorest roads that he used, was nearly 300 per cent. A good authority states that first-class gravel roads would save from one-half to two-thirds of the cost of wagon transportation.

If before we put on the gravel we pared down hilltops somewhat and put the earth in the valleys, we would effect another saving—one very large compared with the expense. Gilmore's tables show that the power that will draw one hundred pounds on a level earth road will draw only seventy-five pounds on a grade of three feet to the hundred, only sixty pounds when the grade is six feet, only fifty pounds when the grade is nine feet, and only thirty-seven pounds when the grade is fifteen feet to the hundred.

Census Bulletin No. 103 shows that excluding those in villages, towns and cities, and on ranges, there were on the farms in the states and territories, June 1, 1890, 14,976,017 horses, 2,246,936 mules, and 49,109 asses (this does not include the two-legged ones that oppose road improvement); a total of 17,272,062 draft animals. It has been argued that with first-class roads we could dispense with 2,500,000 of these animals, which have a money value of $210,000,000; while to feed these unnecessary animals the ordinary army ration for one year costs $130,000,000. Certain it is that at least 6,000,000 draft animals are kept in idleness for two months in the late Winter and early Spring, when with good roads they could be used in hauling farm products to market, and then to do this hauling the farmer would not have to stop his field work during the Spring and Summer, as now. To feed these 6,000,000 animals for two months costs $57,000,000, giving them the ordinary army ration and computing hay at $10 per ton and oats at 23 cents per bushel.

We must not ignore other financial gains from good roads. In every case good roads have appreciated the price of land in a neighborhood to an amount two or three times their cost. Getting two to three dollars for every one invested beats sickle grinders and lightning rods.

Every farmer knows the advantage of nearness to market, school and church. Improving roads shortens distances. The actual distance of land from market is not measured by miles, but by the character of the roads. Land connected with market by ten miles of good roads is nearer than that connected with, or rather separated from, market by five miles of poor roads. Ten miles of solid gravel is shorter than five miles of bottomless mud. Would you bring your farm nearer to town, school, church and market, and largely appreciate its selling price? Then, farmer friend, build good roads.

WIDE TIRES IN DAVENPORT.

DAVENPORT, Iowa, has adopted a wide-tire ordinance, providing that any teamster who hauls a load heavier than a specified weight upon a narrow-tired wagon shall be fined. A Davenport man, however, has asked several very pertinent questions in regard to it, and says: "How are you going to tell whether a teamster has an illegal load on a narrow tire wagon or not? You can't arrest him on the supposition that he has, for if he should be within the limit he would make it hot for you on the charge of false imprisonment. Neither can you compel that man to go and get his load weighed. There is only one way to get around this difficulty: Levy a tax of $5 on every wagon that is equipped with wide tires, three or four inches, say, and a tax of $20 a year on all that have narrow tires, and arrest and fine every man who has not paid his tax within a reasonable time. It won't be more than a year or so until the narrow tires will have disappeared. If they have not, they will be paying a good-sized license for the privilege of ruining the streets."—*Farm Implement News.*

A WAR OF WORDS.

"I SEE your shaft is broken in two," said a well-filled wagon to an empty one. "I always told you to hold your tongue."

"Oh, don't bother me; you're loaded, then go off! —*Rider and Driver.*

ILLINOIS WORK AND WORKERS.

D. W. SMITH.

It is doubtful if in any other state of the Union a greater activity is shown by prominent men in behalf of the movement for better roads than in Illinois. Throughout the whole range of official and social life, from the executive office down to the humblest tiller of the soil, there appears to be a wakening disposition to change the present inadequate road laws and provide for highways that will, in some sufficient way, provide for the internal carrying trade of a populous and wealthy state.

D. W. SMITH.

Prominent among the men to whom is due the credit of this promising agitation is Mr. D. W. Smith, of Springfield, President of the Illinois National Bank and President of the Illinois Road Improvement Association. It is not enough to say that Mr. Smith's energy and capacity as a business man have been known for a long time within the limits of Sangamon County, for he has carried the exercise of his best talent into the work for better roads, and is known throughout the state as the chief executive officer of an association which is doing much to combine and unify the efforts of the various counties, and to secure legislation which will operate for the good of all. No mention of road improvement in the State of Illinois would be complete without a reference to the excellent work of D. W. Smith and his co-workers in the Illinois Highway Improvement Association.

HON. WILLIAM L. GROSS,

Secretary, Illinois State Bar Association.

'Lawyers for legislation and legislation for better roads.' Last March, there was read before the Illinois Highway Improvement Association, a paper which ought to be in the hands of every lawyer in the State of Illinois. Its author, Hon. William L. Gross, of Springfield, than whom no man in the state is better qualified to analyze a legal question or to present it in a terse and lucid manner, is Secretary of the Illinois State Bar Association, one of the most prominent and successful members of the Illinois Bar, and an active agitator for the improvement of the public roads in his state.

HON. WILLIAM L. GROSS.

Did space permit, GOOD ROADS could present nothing of greater value and interest to its Illinois readers than the able discussion of Mr. Gross of the ways and means of procuring better roads for Illinois through the medium of the state constitution and proper legislative enactment.*

We quote briefly from this paper as follows:

"If it be true, as we have shown, that in all the counties of this state not under township organization (and there are nineteen counties of this class) no more than seventy-five cents on the $100 of valuation can be levied for all purposes, including the road and bridge tax, then no argument is required to show that the people of those counties are helpless, and the era of hard roads, if it is to come, cannot now come to them. Most of these counties find it difficult, if not impossible, to meet the current expenses of the county and maintain their common dirt roads, in their present condition, upon a seventy-five-cent county levy. They must, therefore, until relieved by constitutional amendment, be counted out of any scheme for permanent hard roads.

We are left, then, to consider the condition of all those counties that are under the township organization act (and there are eighty-three counties of this class). As to them the legislature is untrammeled, and may operate throughout the present organized township. It is now one of the recognized state agencies and a *quasi* municipal corporation, only less dignified than the county itself. Already it has jurisdiction of all roads within its boundary and may, as we have seen, tax itself for road purposes under existing laws (assuming that the act of 1883 is a valid and constitutional enactment), $1.80 on the $100 valuation of its taxable property. If, however, the act of 1883, designed especially to meet the needs of hard roads, falls, but eighty cents on the $100 valuation can be levied; and this, as all will admit, is an insufficient rate to accomplish the result desired.

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*The address of Mr. Gross has been printed in pamphlet form, and can be obtained by addressing F. W. Gerould, Chief Consul, 108 Madison Street, Chicago.

We are, then, as to both classes of counties, driven to this conclusion:

1. Under present laws, and with the machinery they provide, anything like a general system of hard roads is a legal impossibility; but

2. As to counties *not* under township organization, the legislature cannot, because of constitutional restraints, afford any relief; and

3. As to counties under township organization, the legislature may, if it will, vest the organized township with greater powers of taxation than it now possesses.

The distinction above pointed out and now existing under the constitution and laws, between counties *under* and counties *not under* township organization, is arbitrary and without substance of justification; and we do not go too far when we say that it ought to be removed. Surely the people ought not to be punished or denied the right to impose upon themselves taxes for needed local improvements, because they do not also choose to burden themselves with the expensive and, as the people in so many counties seem to regard as unwise, and complicated machinery of township organization. But whatever may be the merits or demerits of the township organization system (and as to that we need not now stop to consider) it is manifest that in respect of this matter of the power of a local community to make local improvements, as hard roads, the rule of law should be single and of uniform application.

This result can be attained in only one way, that is, by amending the constitution itself. If time and experience have justified township organization as a system of local government, then let the constitution be so changed as to require the legislature to provide by adequate legislation for the township organization system and let it extend to all the counties in the state. This done, the legislature may then vest in the organized township the requisite taxing power to work out the problem of hard roads, and the rule of law will be single and of general application."

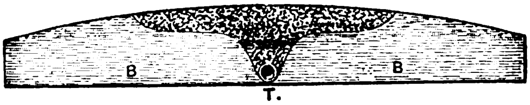
The whole article from which we have made this only too brief quotation, shows deep study and careful preparation, which could only be undertaken by a citizen having a warm interest in his subject, and, when the lawyer's hand is directed to the revision of the Illinois State Constitution and road laws, it is hoped that William L. Gross may have that prominent place in the work to which his knowledge and ability give him title.

HON. H. W. THORNTON, MILLERSBURG, ILL.

In contemplating the strong and sudden impetus which the demand for road reform has assumed in the last few years, it becomes most natural to regard the movement as a new one, and most difficult to understand that a veteran in the war for good roads can be found. Yet here is a man, who, for more than thirty years, has labored with voice and pen for the improvement of Illinois roads and whose practical knowledge and experience have led him to devise a plan for practical road work which the road makers of the western states will do well to investigate. Hon. H. W. Thornton, now a resident of Millersburg, Mercer County, Ill., has just passed his eightieth birthday and is still an active worker in our common field. Writing of his experience in earlier days Mr. Thornton says:

HON. H. W. THORNTON.

"From 1857 to 1868, having in charge the construction of a railroad between Savannah and Warsaw, Illinois, I had occasion to make many trips between those points in company with a civil engineer. The subject of the improvement of the roads we traveled was frequently discussed. The distance being about 160 miles, and most of the way near the Mississippi, many miles all sand. A few miles in the vicinity of Nauvoo stone is abundant, but the greater portion of the distance pure Illinois soil. In Winter or wet weather, the sand made a good road, but in hot, dry weather it became very heavy. When sand was incorporated with the soil, as is often the case between sand drifts and other localities, there was a passably good road at all seasons. Sand in many localities in combination with clay prepared "in the long ago" has given man a foundation for a road way that is always in repair and always good at no expense to anyone. In these 50 years of my journeying over the prairies of Illinois, I became fully convinced that drainage in some way with the use of sand in combination with the soil of the prairies would tend very much toward the improvement of the roads. The clay road bed we have. It is a fixture. It has come to stay. With sand it may be utilized in drainage. Gravel or broken stone is a poor substitute for sand to be incorporated with the clay road bed. Except for water the roads would always be good. Thorough drainage is therefore the cure. If sand is most convenient and cheaper than gravel or broken stone, put down tiling in the centre of the road bed 3½ feet below the surface, the dirt displaced in tiling is distributed evenly over the road bed, first 6 inches next to the tiling filled with the soil of road bed to hold the sand above with which the remaining 3 feet of the ditch is filled. A coating of sand 6 or 8 inches in depth and 6 feet in width is placed on the centre of the road, leaving 6 or 8 feet on either side of this track for a dry weather road. The theory is that continued rains would soon put the central track in use and incorporate the sand with the soil, thereby facilitating drainage of the surface water into the sand or gravel over the tiling, thus securing continued and permanent drainage. This coating of sand may be repeated so as to be thoroughly incorporated with the road bed. The sand mixed with the soil renders the road bed porous in proportion to the quantity of sand in combination with it. No material is better than gravel or broken stone for filling the ditch above the tile; it drains more readily than sand and is preferable in all respects except to combine with clay to make it porous. All three are very useful and necessary in the construction of a good road. Availability and cost of material decide which shall be used in different localities. A well drained road bed by this method requires a less quantity of at least one-half of sand and gravel or broken stone than any method heretofore presented to the public. It will take 1½ to 2 yards of the above to fill the ditch per rod above the tiling and about the same amount as a coating on the central track.



H. W. THORNTON'S CROSS SECTION OF PRAIRIE ROAD.
A, gravel or gravelly clay filling, with sand over tile ; B, natural soil ; T, tile.

At the Springfield meeting of the Illinois Highway Association, last March, Mr. Thornton delivered a most interesting address in which he related many interesting incidents occurring in the early history of Illinois, in which he took personal part. In 1840, with the late Judge Drummond, of the United States Circuit Court, Mr. Thornton represented the "Jo Davies District" (composed of the ten northwestern counties of the state) in the state legislature, then occupying the little old State House at

Springfield. His contemporary workers in public affair at that time included many able men, whom time gave celebrity in later years. Clustering about those early years and with a knowledge and memory that seem surprising, Mr. Thornton relates many interesting incidents bearing on the social and political growth of the state. From Mr. Thornton's Springfield address we quote briefly:

"This morning I went to the old State House, now occupied as a county building by Sangamon County. It was first occupied by the State in December, 1840,—fifty-two years ago last Winter. I was the colleague of the late Judge Thomas Drummond, of the Circuit Court of the United States, in Chicago. The district we represented was known as the Jo Davies, and was composed of the ten northwest counties of the state. I found the house as it was when we first occupied its hall. With its tinge of age it had grown so small. I stood near where I was seated that session. Across the aisle sat that genial and and dashing Colonel J. J. Hardin, who was shot dead at the head of his regiment at the battle of Buena Vista in Mexico; for four months we ate at the same table. President Lincoln, Senator Trumbull, Gen. McClernand, Gov. Bissel, Cyrus Edwards (a brother of Gov. Ninian Edwards) and many others of note I could name. Scarcely an evening passed without Mr. Lincoln at Dr. Henry's—my home for the Winter. As I looked over the hall, in memory I had the ninety-one members seated—but what a reminder of the shortness of life! All gone save Trumbull, McClernand, L. W. Ross and myself—McClernand 80 in June, I in October, Ross in December and Trumbull in '93. I must confess I did feel old with my youngest son by my side in his 36th year. When I think of those surroundings as compared with the present, I do feel oppressed and humbled before you—a body of men from all parts of the state, in the prime of life, assembled in convention in this grand and finely equipped capital of this—our glorious State of Illinois. Bear with me, gentlemen, while I further digress. As late as 1825 Senator Benton, in the United States Senate, declared that 'the ridge of the Rocky Mountains may be named as a convenient natural boundary. Along this ridge the limits of the Republic should be drawn, and the statute of the fabled god, Terminus, should be erected on its highest peak, never to be thrown down.' And later still (in 1828) in renewing the treaty of 1818 with Great Britain, it was agreed—that whoever should first occupy the country beyond this natural barrier should own it. That was only twelve years before these fifty-two years I have referred to. I am deeply impressed with what I have witnessed in these years—then but a few miles of railroad west of the Alleghanies. What progress made and achievements consummated in everything we can name, beyond anything ever on this earth. In the whole calendar of improvements made, the only exception in that long list are our public highways. To-day I stood on the corner where the old American Hotel stood in 1840. I remembered the night in mid-winter as the stage coach left for Chicago in a regular break up and the roads terribly muddy. Its occupants Wm. B. Ogden, Dr. L. D. Boone and others, a delegation from Chicago to secure an appropriation for the Illinois and Michigan Canal. This we would now call a long haul—we have all we had then, mud included, in the short haul, and more of it. Now in the palace sleeper at night, wake up in Chicago for breakfast. Large ships forge their way through storm and calm across the Atlantic in a few days, and well equipped trains go from Boston to the Pacific in less than five days. Where hidden the wealth, the genius and skill of the American people, who have in these fifty years presented to the world a greatness not paralleled in all history. Why should this indomitable spirit of the intelligent energy and power be so appalled and paralyzed when in the presence of the mud road, over which all the tonnage of the land is transported, and in the mud, at least, three months in every year, and as regular as the seasons? It is a great mystery to me that in everything else the American people are ready for every emergency and victorious, save this one dark spot. Hitherto we have been and are to-day helpless. It is humiliating that this great nation should be the laughing stock of Europe at the public highways of this land. I may be an 'old fogy,' but I can't see why it is, when I put the products of my farm on a boat to go to market, Uncle Samuel is ever ready to remove every obstruction in my way, and millions are appropriated annually for that purpose, and also to perfect my land from overflow; but for the public highways not one dime. No listening ear to the calls of an oppressed people, hustling in the mud for help! Who so ready to respond to the calls of that government, when assailed, as the same fellows in the mire, to save and give victory to her in her days of trial? The days are coming when these United States will heed the calls of her most staunch and trusted friends. So, too, the states and counties, and not confine this great work to the smallest division on our maps. We are all of one family, and whatever tends to the welfare and happiness of the people, constitutes the wealth of the nation."

WILLIAM A. CONNELLY,

Editor Danville News, Danville, Ill.

There are many men in Illinois of whom the wheelmen of America have abundant reason to be proud, and not least among these is William A. Connelly, Chairman of the Illinois Division Committee on Improvement of Highways, and editor of the *Danville News.* There is an inside history of the road improvement agitation in Illinois which the progress of time will yet make public; but if the reader should have the good fortune to be acquainted with William A. Connelly, he may discover a twinkle of satisfaction in the eye of the chairman that betokens an abundant knowledge of the machinery and the comfortable feeling of a man who enjoys the result of well done work. Among the farmers of Vermilion County, Mr. Connelly has many friends who recognize his ability and give evidence of his work for better roads, and among the wheelmen of the state he is regarded as peculiarly fitted to occupy his official place at the head of their most important committee. That the good work begun and good results so well attained under the able direction of Mr. Connelly's predecessor (Mr. F. H. Holmes, of Kankakee), will be carried to ultimate success, we have no present reason to doubt. In the future work for good roads in the State of Illinois, Mr. Connelly will hold a prominent and influential place.

WM. A. CONNELLY.

DR. A. L. CONVERSE, SPRINGFIELD, ILL.

The proceedings of the March meeting of the Illinois Highway Improvement Association were widely exploited by the press of that state, but it is doubtful if any paper was read with greater interest or was more deserving of the favorable comment it received than that presented by Dr. A. L. Converse, of Springfield.*

The exceptional merit of this paper will justify us in making here a brief quotation:

"The man who expects to succeed in this day and generation by an ignorant, half-hearted and haphazard way of doing things, will soon demonstrate to others, if not to himself, that he is a miserable failure; as well try to raise chickens by setting a hen on a lot of porcelain door knobs, as undertake to make a road by enforced labor under the direction of an inexperienced road boss. The idea of getting something for nothing, or a valuable thing for a pittance is one of the exploded fallacies, retained only by the ignorant and superstitious. There is no cheap way of making pure gold. The city, county or state that expects to have good roads must be willing to pay the price. I am well aware that the subject of taxation is not a pleasant one upon which to dwell, yet nevertheless it is a tribute that savagery pays to civilization, and if we must boast ourselves of that highest civilization, we must submit to taxation. The luxuries which go to make life now endurable were not once indispensable. Fig leaves at one time answered the purpose, but it was not long until the skins of animals took their place. The wearing of either is not now tolerated in good society. Luxuries soon become necessities. May the time soon come when the good road will cease to be a luxury and be placed in the category of a positive essential. I am glad to know that attention is being turned to this subject in this country as never before; that wide awake, enterprising and enthusiastic individuals are collating information upon systems and modes of constructing and maintaining public highways throughout the civilized world; that in the city of New York is being published a monthly devoted exclusively to this subject, which I feel certain will awaken an interest that will culminate in a better condition of things. I am indebted to this monthly for the information which I shall set forth, and trust that the spirit of bigotry may not be ours to the extent that we will be unwilling to profit by the experience of any people that has succeeded in any direction. Probably no country has made as rapid and positive strides in the direction of good roads as the republic of France. Her roads are principally constructed and maintained from the public purse.

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*This paper has been published in leaflet form by the Illinois Division of the League of American Wheelmen and copies may be had of Chief Consul F. W. Gerould, 108 Madison Street, Chicago, Ill.

DR. A. L. CONVERSE.

"There is an official in chief who has the charge of all of the main roads in the republic and who, from the frequent reports of his subordinates, keeps thoroughly informed of the condition of the roads. The work is divided in sections and placed under the direction of engineers and superintendents. Material is furnished by contract. The system is so complete in its arrangements, and the officials are held to such strict accountability, that it is claimed that infinitely better roads result than from the old system in which the farming community took a hand in their construction and maintenance. The whole being done at an annual expenditure surprisingly small as compared with the outlay under the old system."

J. H. HACKETT, JACKSONVILLE, ILL.

Notwithstanding the exacting cares imposed by the duties of business and official life, it is doubtful if there can be found in Illinois a man whose interest and effort are more strongly directed to the well-being of the state than J. H. Hackett. Mr. Hackett is secretary of the Security Savings, Building and Loan Association of Jacksonville and is well known throughout his section of the state as a man of high business integrity and ability. His active work in the formation of the Illinois Highway Improvement Association, of which he is one of the officers and his strong advocacy of the proposition for national aid in the construction of state roads, have made him prominent among the road improvement agitators of the country. Mr. Hackett's position may best be defined by quoting from a recent paper, of which he is the author:

J. H. HACKETT.

"When the people of this country want anything and want it badly, they proceed to get it in some way. Good roads they want and good roads they are going to have. A few years ago the streets of our interior cities were in a deplorable condition. At certain seasons of the year the mud was horrible. For days and even weeks traffic was wholly or partially suspended. Such transportation as was absolutely necessary was done over the sidewalks by means of wheelbarrow or hand cart. There was much talk about pavements, but as stone was very costly and wood not durable, it looked as though the people were doomed to spend their days in discomfort and disgust at such a state of affairs. But such was not to be their fate. About the time they were ready to stop talking and *do* something, it was discovered that hard burnt brick made a first rate pavement where the traffic was not too heavy, and most of the smaller cities set to work building brick pavements. After a dozen or more years' trial, the wisdom of this has been demonstrated by greatly increased population and advance in value along the line of such streets as have been so improved. While brick is probably the cheapest and best of anything yet discovered for city pavements, yet we must find something still cheaper for country roads. Even Illinois would undoubtedly amend her constitution if by so doing a few million of government money would be expended within her borders. If this view is correct, then our relief is through Congress. Let the General Government be opportuned to offer assistance to such states and communities as are able and willing to bear one-half the expense of building permanent roads, and the people of Illinois will find a way to take advantage of the offer.

"The writer does not wish to be understood as deprecating the agitation and discussion of the material and manner of building country roads. But while doing this, the main question of the means for this great work should receive the attention it deserves, and must have it if we are to succeed in building what may be termed 'permanent roads' in Illinois to any great extent."

A. A BILLINGSLEY, OF SPRINGFIELD,

Vice-Consul Illinois Division, L. A. W

Less than two years ago it was seriously proposed by some of the leading spirits of the League of American Wheelmen, to abolish the office of vice-consul in each of the several states. It was argued in support of this proposition that the office was scarcely more than a nominal one, that its few and uncertain duties were likely to be performed in a half-hearted and perfunctory way, and that the office was neither an honor to its incumbent nor a benefit to his division. Whatever may be found to assert the truth of these arguments in other states, it must be said that the proposition is completely and brilliantly refuted by Illinois, whose able vice-consul, Mr. A. A. Billingsley, of Springfield, supplies an example of work and success which may well serve as a standard for emulation for vice-consuls in other states. No man could more cordially enter into the spirit or more actively engage in the lines of a broad-minded and liberal policy than has Mr. Billingsley in that of his able chief-consul,

A. A. BILLINGSLEY.

Mr. Gerould. His interest in the work for better roads seems to grow from that statesmanlike sentiment which has taken so strong a hold among the wheelmen of Illinois within the last two years. He recognizes first, that the wheelman is a citizen, endowed with a citizen's rights, possessed of a citizen's interest in the affairs of state, and by reason of the emphatic object lessons forced upon the mind of every wheelmen by the intolerable badness of Illinois roads, he feels his superior qualification to teach the reasons and rules for the improvement of these roads and to exert every honorable means for the attainment of that end. And so, in the light of these beneficent facts, he exerts his official influence as vice-consul of his state division as well as his personal effort as a citizen in pushing the agitation of Illinois road laws and placing before the farmers of Illinois those lessons of economy which appeal for better roads and the examples of waste and extravagance which the use of the mud road entails.

At a recent meeting of the Sangamon Farmers' Institute, Mr. Billingsley presented his argument for better roads in a paper in which the facts are so plainly stated and conclusions so irresistibly drawn that it may be doubted if the farmers of that county may find more pertinent or profitable reading than this address supplies.* It is well deserving of a wide circulation.

We look with confidence for the widening influence of Mr. Billingsley's work, not only in his own county, but throughout the whole State of Illinois, in the affairs of which he seems destined to hold a prominent place.

IN the decade ending in 1890, the population of Illinois increased about 741,000, but this increase is largely confined to her populous centres. Thirty of the agricultural counties of the state show a decrease of population during the same period. Although the entire increase of population in the state is shown by the census to be in exact numbers 740,665 in the decade mentioned, it is also shown by the same authority that the increase of population in Illinois' cities and towns during the same period was 751,303, thus showing that throughout the state at large a loss of rural population has apparently taken place in the last ten years.

THE wealth of Illinois amounts to more than $1,000 per capita for her entire population.

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*It is regretted that a copy of Mr. Billingsley's address was not received at the office of GOOD ROADS till after the Illinois number was fully made up and in press, and therefore too late for publication.—*Editor.*

THE WORK OF THE COMING YEAR.

By F. W. Gerould, Chief Consul, Illinois Division. L. A. W.

THE work for better roads is the one prominent object which has clothed the League with a mantle of dignity and drawn into its ranks hundreds of good men to whom the organization presents no other feature which strongly invites sympathy and affiliation. It has given to the League a prominence in public affairs never before attained by a similar body in the history of the country, and has done more to dispel the common prejudice against cycling than have all other forces combined. To the wheelmen of Illinois I take this occasion to address a word of congratulation for the splendid loyalty shown and good results attained by them in the road improvement campaign of 1892. It is neither fit nor necessary that these results should be recounted here; they are as familiar to us all as are the signs of the future. Let me only remind them that the time seems close at hand when the public demand in Illinois will be directed to the enactment of new road laws and the construction of at least the main roads according to methods which are so well proven as to be worthy of adoption by a great state. It may be reasonably anticipated that this reform, like all reforms that the world has seen and will see, will have to be attained in the face of fierce opposition, and by a conquest of prejudice that can only be achieved by a well organized, well disciplined and well informed force. I urge the wheelmen of Illinois to close ranks and strengthen their equipment for this contest. Arm yourselves with every fact and every argument that will benefit the cause of the state in its struggle for highway improvement. Read your GOOD ROADS magazine from month to month, and send the separate numbers to the prominent and thoughtful men in your neighborhood, who are likely to be influenced by the articles and arguments it contains. If the

F. W. GEROULD.

roads in your vicinity are specially bad, obtain pictures of them during the wet seasons of Spring and Fall, and send them to Good Roads to be reproduced in its pages, or in the form of lantern slides, where they may eventually do telling work in our own state. Keep in touch with your State Committee on Improvement of the Highways, and do not hesitate to communicate with its chairman, or with the editor of Good Roads, when you desire information or have an item of news to offer. And finally, retain your League membership, and do what you can to increase the strength and numbers of the Illinois Division.

From 1880 to 1890 Illinois' state debt decreased over $250,000; her total county debts decreased over $3,000,000; her municipal debts decreased about $1,000,000 and her school district debt decreased over $200,000.

The average annual decrease in the national debt of the United States during the last decade exceeded $100,000,000; the decrease per capita of combined national, state, and local debt during the same period was from $60.73 to $32.37, while other statistics show that the value of property assessed for taxation increased meanwhile from $17,000,000,000 to $25,500,000,000, or 50 per cent. indicating a reduction of public debt and an increase of wealth for the country unprecedented at least in modern times.

In the year 1889 the farmers of Illinois planted in barley, buckwheat, Indian corn, oats, rye and wheat over 14,000,000 acres and raised a total of about 470,000,000 bushels of these cereals. Her average yield in bushels per acre for each cereal was as follows: Barley, 28.93; buckwheat, 10.97; Indian corn, 36.84; oats, 35.75; rye, 15.87; wheat, 16.68.

The total actual value of real and personal property in Illinois liable to taxation, is nearly $3,000,000,000. The assessed valuation is about 25 per cent. of this sum.

Illinois has about 240 cities and towns containing a population of 1,000 and upwards.

In the northern central group of states various conditions prevail. In Ohio, Indiana, Iowa, and Missouri, and in Illinois, if the city of Chicago be dropped from consideration, the rate of increase (of population) has declined very decidedly. In Ohio it has fallen from 20 to 15 per cent.; in Indiana from 18 to 17; in Iowa from 36 to 18; in Missouri from 26 to 24 per cent. in spite of the rapid growth of St. Louis and Kansas City, and in Illinois, dropping Chicago from consideration, from 14.9 to 5.9 per cent.

THE EDITORS TABLE

This copy of "Good Roads" has a special value to every citizen of Illinois. After you have read it you can aid a good work by sending it to either of the following named persons: F. W. Gerould, 108 Madison Street, Chicago, Ill.; A. A. Billingsley, Springfield, Ill.; W. A. Connelly, Danville, Ill.

LET us forever absolve ourselves from the ridiculous arguments which favor "local management" of the country roads. It has been tried everywhere and has never succeeded anywhere. Indeed, if results count for anything, there is no such thing as local management. We have had local mismanagement for about a century, and European countries had it for centuries before us. The slavery of custom has given many of us the hide-bound conviction that the roads in each particular locality are, by right, the special care and property of the people who happen to live in the immediate neighborhood. Let us forever understand that this idea is widely astray. It is the creature of custom—a custom born of convenience.

When, for example, a public road is opened in Vermilion County and dedicated to the uses of all the people, the common easement acquired by the commonwealth in that road belongs alike to all persons who choose to travel it (D. V.), and its care, repair and maintenance become matters of concern to the entire state and subjects of legislation in which the representatives of all the people may take part. That the legislature has delegated to the county officials certain artificial powers of local management, and permitted the good people of Vermilion County to indulge in a kind of periodical and perfunctory paving of the mud adjacent to their own doorways rather than send them on a distant and dangerous journey to Jo Davies County for the same purpose, tends only to show that the legislature recognized that doctrine of convenience which prompts people to do things the easiest way, and it is yet for the people at large to say whether the citizens of Vermilion, or any other county in Illinois, shall be longer encouraged in the primitive, inefficient and extravagant methods of "local management" which for months in the year have left their roads impassable for themselves, as for all the world besides. Of course there was once an excuse for all this; but the day and the reason have gone by. Estimates, examples, experience and results everywhere concur in demonstrating the endless waste which the use of these mud roads entails, and in emphasizing the farcial results of "local management." There should be a centre of information and direction; a method of work following the lines laid down by a well equipped department of the state government from whose fund of knowledge and information all may draw and to which all may contribute. In what manner such a department may best be established is a problem which Illinois cannot too quickly solve. A commission of inquiry similar to that now at work in Massachusetts would doubtless bring much enlightenment to the people of Illinois, and the creation of such a commission by the new Illinois legislature will be eminently in order.

TO YOU.

Here is an important petition. Cut it out; affix it to the head of a sheet of writing paper of generous length. GET SIGNATURES AT ONCE. Ten,—a hundred,—a thousand,—as many as you can. Then return it to GOOD ROADS (Potter Building, New York City) within a week after you receive this copy. *This is important. If you have not done anything for the cause, do this, and do it now.*

To the Honorable Senate and House of Representatives in Congress assembled:

We, the undersigned, citizens of the United States, hereby most respectfully petition that there be founded in the city of Washington, in the District of Columbia, a Road Department, similar to the Agricultural Department, for the purpose of promoting knowledge in the art of constructing and maintaining roads; and we ask that in such department provision be made for teaching students so that they may become skilled road engineers.

In connection with this Road Department we request that there be established a permanent Exhibit in which shall be shown sections of roads illustrating various methods of construction and also the best road materials and machinery.

We further petition that Congress appropriate funds sufficient to erect a building at the World's Columbian Exposition for the purpose of a comprehensive road exhibit.

QUERIES AND ANSWERS

"S. S. V." (Newburg, N. Y.)—We cannot here devote the space necessary to print an outline of constitution and by-laws for your proposed local road improvement society. Send us your full name and address and we will then send you printed pamphlet that will aid you.

"John K." (Springfield, Mass.)—(1). In providing a steam engine to drive your stone crusher you will find it cheaper, though not necessary, to use a larger engine than that mentioned in the table contained in the manufacturer's catalogue. (2). A cubic yard of stone will weigh about one and one-third net tons—varying with the quality of the stone and the sizes of the separate pieces. (3). The machine you describe, if well handled and properly "fed," should produce from fifty to sixty cubic yards of broken stone per day of ten hours.

"Mitchell" (Washington, D. C.)—Macadam was not an ardent advocate of the rolling methods now commonly employed in road making; probably for the reason that road rollers first came to be used after Macadam's day. Their importance and value were first made known to the English people by Sir John Burgoyne in 1843. Steam rollers are generally preferred by road experts, though excellent work may be done with horse rollers, and these are sometimes given preference on account of their greater cheapness in point of first cost.

"Medick" (Albany, N. Y.)—We supply bound copies of Vol. 1 of Good Roads. The price is $2 per volume; or $1 if you send us the separate magazines for binding.

"P. R." (Trenton, N. J.)—Write to your Chief Consul or to the Chairman of your State "Road Book Committee." Road books are not prepared at this office.

"F. F. Sabin" (Peoria, Ill.)—There has been a decrease of population in some of the agricultural counties in each of the populous western states and in many of the eastern ones during the last ten years. There are various theories to account for this decrease, but it is probably owing to a lack of conditions favorable to general thrift, not the least of which is the difficulty of communication between farm and market.

"L. A. W." (San Francisco, Cal.)—The Roads Improvement Bureau is supported by the League, by contributions from friends of the movement and by income received from advertisers and subscribers. It expends all its income to advance the movement and enlarge the circulation of the magazine and does not seek to accumulate any "surplus fund."

"R. U. G." (Peoria, Ill.)—Asphaltum is obtained in its natural state in several parts of the United States, and resembles the Trinidad product to a greater or less degree, depending upon the locality where found. We believe this asphaltum is taken out in paying quantities from natural beds found in Utah and California.

"Roger V." (Elizabeth, N. J.)—The publishing of specifications for construction of wood pavements, in a recent number of Good Roads, must not be regarded as signifying our approval of that kind of pavement; but it has the merit of cheapness in many localities where stone is scarce and wood plenty, and is infinitely better than the common dirt road which runs through many towns in both our western and eastern states. If the materials are well selected and carefully put down it will last for some years and when in good condition is almost noiseless, has good tractive qualities and supplies a surface agreeable and easy to the rider and driver. The objections frequently urged against this kind of pavement are that it quickly absorbs and holds moisture, that it is difficult to take up and relay when underground work becomes necessary, that in wet weather it becomes slippery and sometimes unsafe for horses, that it is not easy to keep clean and many physicians urge that it is injurious to the public health. As to the last named objection, a casual glance at the statistics does not seem to support it. In Chicago 80% of the street pavements are of wood; in Milwaukee 48%; in Detroit 91% and in Duluth 9[illegible]%, and the death rate per thousand in these four cities is shown to be 17.45, 16.90, 14.70 and 9.17 respectively. In Philadelphia, Boston and New York, three cities in which wood pavements are not used, the death rate per thousand is found to be 19.74, 23.31 and 25.19. Of course these figures do not prove that wood pavements are not injurious to the public health, but they supply some evidence to show that they have no marked influence in increasing mortality as compared with cities where wood pavements are not used.

"E. S. M." (Toronto, Canada.)—It is easier to start a loaded wagon with springs than to start a wagon with the same load having no springs, because in the first case the different parts of the load and wagon are not rigidly combined, and when the hauling force is applied to the wagon, it tends, first, to overcome the inertia of the wagon and then of the load; in other words, the inertia of the wagon and load need not be overcome all at once. You will see this fact practically illustrated the next time you notice the starting of a loaded wagon having springs; when the force is first applied the wagon trucks seem to start from beneath the load and the elastic force of the springs tends to start the balance of the load more gradually. In the same manner a spring wagon causes less damage to the roadway, because in rolling over inequalities of the surface it exerts less of that "hammering" force that is applied when the same load is carried on a springless wagon. You may easily illustrate this point by the practical experiment of holding a thick piece of rubber or stiff spiral spring on the head of a spike while trying to drive it. The same amount of force is exerted against the spring as would be necessary to drive the spike quickly under ordinary conditions, but the force is taken up by the spring and then transmitted gradually to the spike, thus destroying the force of impact which is really required to drive it into a piece of wood. In a similar way the downward motion of a heavy load carries a force which is taken up by the springs when the wagon goes over a "jolt," and the "hammering" effect that would otherwise injure the roadway is obviated.

"J. F. W." (Washington, D. C.)—As between city and country, the proportion of general taxes paid by each in different states varies widely, but in our most populous states, the bulk of wealth and population is found in the incorporated cities and villages and the larger proportion of state taxes in each of these states is borne by the cities and villages. In the State of New York, the farmers pay only about ten per cent. of the state taxes. In some of our less populous states they pay a larger proportion and in some of the purely agricultural states they bear the larger part of the expenses of state government. Neither of these conditions should afford any argument against the improvement of the public roads. The money spent for a good road has turned out in every case to be an investment, rather than a tax, and no farming community, having once adopted good roads, would be willing to give them up at four times the cost. They develop the country, decrease expenses, increase the value of property, equalize property valuations and distribute the burdens of taxation for all time. Last winter, in the city of New York, the price of baled hay rose from 80 cents to $1.15 per hundred pounds within a few days, because the muddy roads made it impossible for farmers to connect with the hay market. The consumer suffered by reason of the enhanced prices, the farmer suffered from inability to market his goods and the margin of difference shown by the raised price (35 cents per hundred pounds) went into the pocket of the middle man or speculator, who was the only person benefited. A thousand other cases of similar nature might be cited, but we mention this one only to illustrate the general desirability of better roads for both the farmer and the city resident.

CONTRACT NOTES

ROADS AND STREETS.

MISSOURI.—WEBB CITY.—New sidewalks are to be laid in this town for which bids will be received until January 2. For further information address H. B. Fraser, City Engineer.

KANSAS CITY.—The work of macadamizing, grading and paving is to be begun here, and bids are being received by John Donnelly, City Engineer.

CALIFORNIA.—SANTA BARBARA.—Estimates have been prepared by the City Engineer for sidewalks and paving which is estimated to cost $22,000.

PENNSYLVANIA.—READING.—At a special meeting of Reading Councils last week an ordinance was introduced appropriating $600,000 to pave all the principal streets in that city. It is estimated that over twenty miles of streets can be paved with this sum. The matter will be voted on by the taxpayers at the Spring election.

EASTON.—It is under the consideration of the City Council to pave two streets with vitrified brick on a 6-inch base of concrete.

WILKESBARRE.—Flagstone sidewalk, vitrified brick or granolithic gutter is to be used around the court house yard and bids have been authorized to be asked for by the Street Committee.

DISTRICT OF COLUMBIA.—WASHINGTON.—The work of furnishing paving brick will be advertised for until December 10, by the District Commissioners.

MINNESOTA.—MINNEAPOLIS.—Surveys, etc., have been prepared by the City Engineer for improvements and extensions in five streets of this city. Bids will probably be asked for.

MAINE.—BANGOR.—115,000 granite blocks are required here, for which bids will be asked until the middle of December. Further information may be obtained of Street Commissioner C. W. Woodbury.

NEW JERSEY.—ATLANTIC CITY.—A contract will be awarded soon for rebuilding Pacific Avenue with gravel, the estimated cost of which will be about several thousand dollars.

WISCONSIN.—FORT HOWARD.—Bonds for the amount of $15,000 for public improvements have been voted to be issued by the city.

INDIANA.—MUNCIE.—Several sidewalks are to graded and paved and the City Clerk will receive proposals for the work.

OHIO.—WINTON PLACE.—Fairview Avenue is to be improved, and bids will be asked for by the Clerk of the Village until December 13.

LOUISIANA.—NEW ORLEANS.—Rampart Street, between Dumaine and Esplanade Streets is to be paved, and bids have been authorized to be asked for by the City Comptroller.

NEW YORK.—SARATOGA SPRINGS.—Bids will be received for a few weeks for the work of flagging, curbing and paving in this city, by the Street Commissioners.

NEW YORK.—One street is to be paved with asphalt and thirteen streets with granite blocks and bids will be received at the Department of Public Works until December 13.

COHOES.—Bids are being received for the work of laying stone, Portland cement and asphalt sidewalks in this town.

BROOKLYN.—Bids are being received for the work of grading and paving Prospect Avenue, from the city line to Ninth Avenue, with cobble stones. Address Commissioner of City Works.

TEXAS.—WAXAHACHIE.—It is proposed to pave some of the streets of this town, and bids will probably be asked for when the work of construction is thought advisable to be begun.

COLORADO.—DENVER.—Until December 20 bids will be received for the work of paving Blake Street, the estimated cost of which will be about $50,420.

SEWERS.

MISSOURI.—KANSAS CITY.—The sum of $10,000 has been appropriated by the Council for the erection of a sewer along the old Missouri River bank, from Santa Fe Street to Genessee Street. Bids will probably be asked for.

IOWA.—WATERLOO.—A new system of sewers is to be constructed in this place. The city will be divided into four districts, and the sewers will be paid for by assessment and the issuance of bonds.

KEOKUK.—W. H. Jones, City Engineer, is receiving bids for laying tile sewers in this town.

OTTUMWA.—Bids are being received by the City Engineer for two 12-inch sewers.

NEW YORK.—SARATOGA SPRINGS.—Bids are being received by the Board of Trustees for a pipe sewer in North Street.

BROOKLYN.—The Commissioner of City Works is receiving bids for the laying of three lateral sewers.

Bids will be received until November 11, for two sewers, by the Commissioner of City Works.

WATERLOO.—Samuel D. Backus of Canandaigua has prepared plans for a sewerage system. Bids will be asked for shortly.

NIAGARA FALLS.—Until November 25, bids will be received for a trunk sewer consisting of an eight foot tunnel about 5,000 feet long and 45 feet below the surface. City Engineer, E. Z. Burns.

COHOES.—A lateral sewer is to be built and bids will be received by the City Clerk until November 15.

ALBANY.—A 15-inch vitrified stoneware pipe drain is to be constructed in Myrtle Avenue and the Board of Contract will receive bids.

ILION.—Bids will soon be asked for a new system of sewers, including eleven miles of pipe.

Chautauqua.—Bids are asked until November 30, for furnishing necessary machinery and appliances for the treatment of sewage at this place. Samuel M. Gray, Consulting Engineer, Providence, R. I.

CONNECTICUT.—Wallingford.—The sum of $8,000 has been voted for a sewer in Main Street. Bids will be asked for in all probability in a short time.

MASSACHUSETTS.—Milton.—It is reported that an appropriation of $5,000 will soon be issued for the construction of a sewerage system in this city.

Brookline.—The sum of $17,000 was appropriated for sewers, by the citizens' special town meeting on October 31.

Lynn.—Sewers are to be built in four streets by order of the Council. Bids will probably be asked for at an early date.

Waltham.—It has been decided to extend sewers in two streets.

CALIFORNIA.—Santa Barbara.—Estimates have been prepared by the City Engineer for 9,756 lineal feet of 6 and 8-inch sewers, to cost about $13,000.

Modesta.—This city has voted to issue bonds for a system of sewers to cost $25,000.

On November 19, it will be voted upon as to the advisability of issuing bonds for $85,000 for the work of constructing sewers and water-works.

VIRGINIA.—Lynchburg.—Proposals are invited by the Council Committee on Sewers for the construction of a stone sewer in the ravine between First and Second, Polk and Monroe Streets. Plans and specifications can be seen at the office of the City Engineer.

NEW JERSEY.—Jersey City.—At a meeting in the office of the Street and Water Board lately, December 27 was fixed for final hearing upon the construction of a sewer in Pavonia Avenue, improvement of Brunswick Street, Seventeenth Street and Henderson Street sewer.

Weehawken.—Bids will be asked for at an early date for the work of constructing a sewer in Willow Avenue.

WISCONSIN.—Racine.—The estimated cost of the two new brick sewers is about $14,00

PENNSYLVANIA.—Berwick.—Preliminary surveys are being prepared by Alexander Potter for a separate system of sewers, about 9½ miles.

Chester.—Bids are being received by the Committee on Sewers for two new sewers.

Pittsburg.—Several sewers are to be constructed in this city, for which bids will probably be asked at an early date.

Kingston.—The question of constructing a new sewerage system is being considered in this city.

Philadelphia.—The sum of $1,250,000 has been recommended to be appropriated for the construction of sewers next year, $250,000 of which sum will be set apart for the Aramingo system.

OHIO.—Cleveland.—Five streets in this city are to have sewers and the plans, etc., have been prepared. Bids will probably be asked for at an early day.

INDIANA.—Fort Wayne.—F. M. Randall, City Engineer, will receive bids until December 13 for the work of laying one mile of 6-foot double-ring brick sewer,

ILLINOIS.—Weston Springs.—A system of sewers to cost $160,000 is proposed to be built in this place in the near future.

WASHINGTON.—Whatcom.—A sewer tunnel has been authorized to be built by day labor under the direction of the Sewer Committee, at an estimated cost of $20,000.

MICHIGAN.—Isphеming.—About $30,000 is to be expended on a new system of sewers in this city this Fall. Bids will probably be asked for in due course of time.

Grand Rapids.—It is proposed to construct a four or five foot trunk sewer to extend from North Street to the river, and estimates are being prepared by the City Engineer.

Dowagiac.—Pennsylvania Street is to have a new sewer, as was voted by the Common Council.

WEST VIRGINIA.—Parkersburg.—The City Council will soon ask for bids for the construction of an 18-inch sewer, with 6-inch laterals to be built in one street.

TENNESSEE.—Nashville.—The Spruce Street sewer is to be extended and bids have been directed to be asked for.

COLORADO.—Denver.—The cost for the estimates of the sewer in West Denver sewer district No. 2 is about $116,250. Bids will probably be asked for at an early date.

BRIDGES.

NEW YORK.—Troy.—At a meeting of the Common Council the Mayor directed the City Engineer to prepare specifications for the new bridge to cross the Poestenkill at Hill Street. The present structure, which is old and of wood, will be replaced by the new bridge. It is proposed to run the bridge across at right angles. The approach from Hill Street will commence at the terminus of the granite pavement. The new bridge will be built of iron, the surface having a brick or granite pavement, with sidewalks, curbs and gutters, and the cost will probably reach $20,000.

Waterport.—A bridge that will span the creek and the race is to be built in this town, at a cost of $10,000.

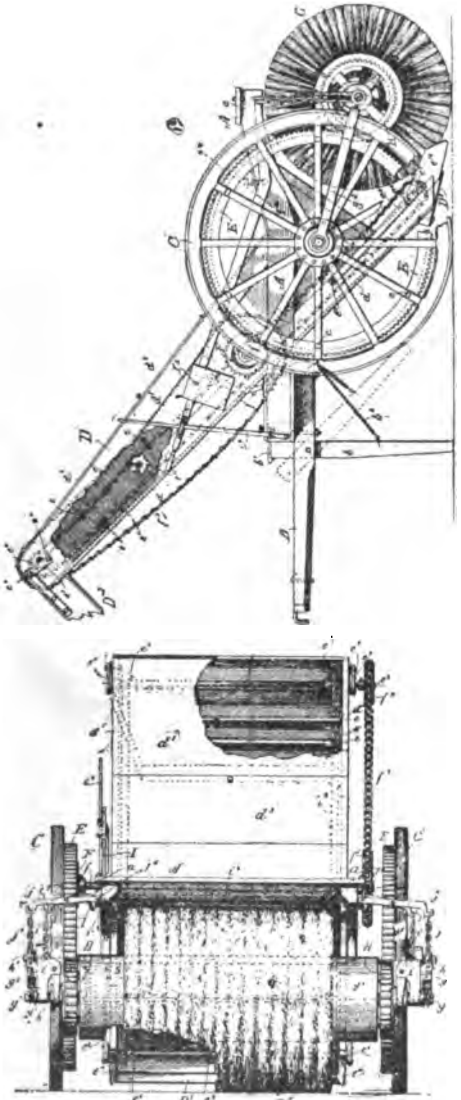
MARYLAND.—Baltimore.—Sealed proposals will be received at the office of the City Commissioner to trestle up and remove the present bridge over Jones' Falls on the line of Baltimore Street and to furnish the materials and construct a new bridge. Specifications and all further information can be had at the office of F. H. Smith, Engineer, 227 East German Street.

NEW HAMPSHIRE.—Jackson.—The town of Jackson has voted to build two new bridges; one to replace the "Gill Bridge," and the other to replace the bridge near Hurlin's store.

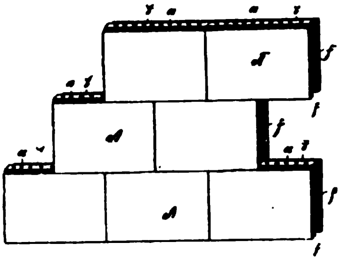
PENNSYLVANIA.—New Cumberland.—It is probable that an effort will be made in the Spring to erect a new bridge from this place to Steelton. A survey has been made and things have been put in shape to make an early start with the proposed bridge as soon as the Winter passes.

WISCONSIN.—Milwaukee.—The specifications for the new Menomonee Valley viaduct are being prepared. This viaduct is to connect Sixteenth Street and Eleventh Avenue.

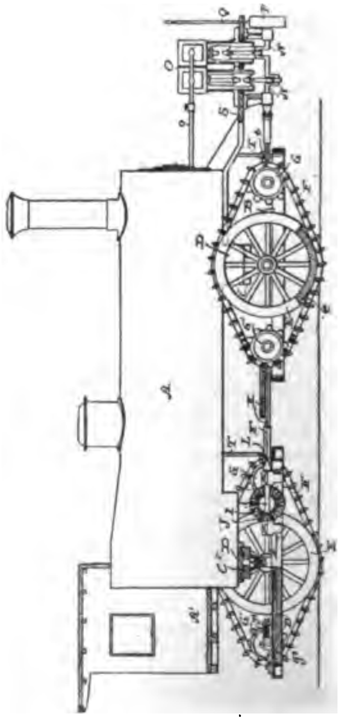
In this department we shall print from time to time brief descriptive notes of recent patented inventions relating to roads, streets, drainage, bridges and wheeled vehicles.



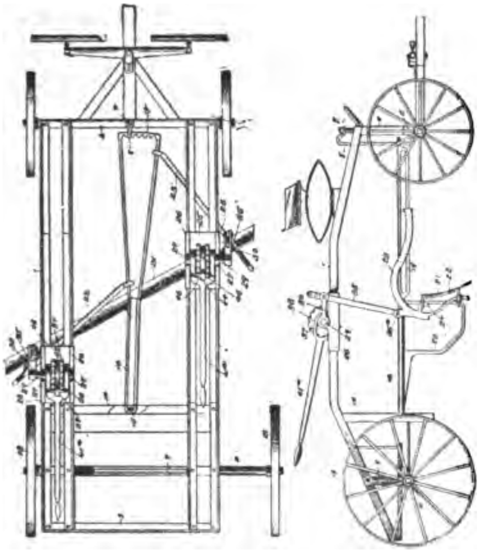
STREET-SWEEPER. ARCHIBALD B. VANDEMARK, Patentee, New York, N. Y. In a dirt-loader, the combination, with the axle and ground-wheels, the inclined chute mounted thereon, the endless conveyer mounted in said chute and driven from the ground-wheels, the broom rotatively mounted in drawing-links pivoted to the said axles, and the gearing intermediate between the broom and ground-wheels, whereby the former is driven from the latter, of means for raising the broom and a disengaging mechanism, operated automatically when the broom is raised for disengaging the gearing which drives the broom.



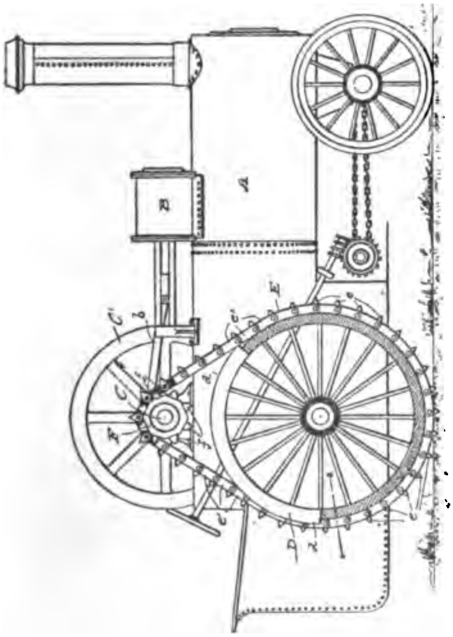
BRICK. LEONARD H. DE FERNELMONT and HENRY H. DE FERNELMONT, Patentees, Detroit, Mich., assignors, by mesne assignments, of one-third to said Leonard H. de Fernelmont. A hollow rectangular brick having a raised tongue on two adjacent right-angle edges and corresponding grooves in the two opposed edges, a series of transverse partitions joining the sides of said brick and forming a series of vertical chambers, said chambers opening into the groove in the edge of the brick at their base, the raised tongue on the opposite edge of the brick having a series of small apertures passing therethrough that communicate with a series of vertical chambers within the brick.



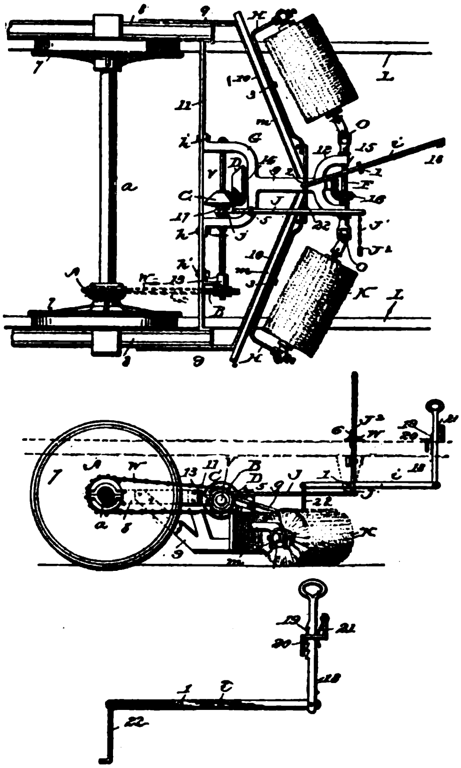
TRACTION-ENGINE. DAVID S. STEWART, Patentee, Morris, Wis. In a traction-engine, one or more trucks, each provided with a single traction-wheel upon each side, traction-chains trained over said traction-wheels, and means for giving independent longitudinal motion to said chains.



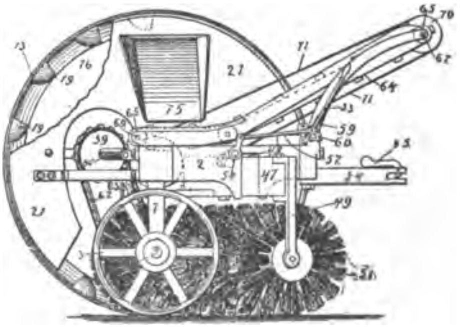
ROAD-GRADER. James M. Holland, Patentee, Mount Pleasant, Iowa, assignor to the Mount Pleasant Road Grader Company, same place. In a road-scraper the combination, with the front and rear trucks and a clevis loosely connected to the front truck, of a draft-bar pivoted at its rear end to the rear truck, a toothed curved bar located at the front end of the draft-bar and adapted for removable engagement with the clevis, and a scraper-blade connected with the draft-bar.



TRACTION-ENGINE. David S. Stewart, Patentee, Morris, Wis. The combination, with the traction-wheels of a traction-engine, of a traction-chain passed around the lower part of the peripheries of said wheels and suitable actuating-gears mounted directly upon the crank-shaft of the engine and adapted for engagement with said chains.



TRACK-CLEANER. Charles E. Bostwick, Patentee, Du Bois, Pa. In a track-cleaner, the combination, with the oppositely-disposed brushes and means for supporting them at their inner ends, of levers pivotally supported between their ends and having their outer ends constructed to form supports for the said brushes, and an equalizer-bar connecting the inner ends of the said levers.



STREET-SWEEPING MACHINE. Eugene Wallace, Patentee, Minneapolis, Minn. The combination, in a machine of the class described, with the frame and the angularly-placed dirt-collector, of the driving-wheel provided with an inwardly-projecting flange, a series of buckets upon the inner surface of said flange, a spout projecting within said flange at the upper part of said wheel, and an upwardly-projecting driven carrier adapted to receive material from said spout.

BORROWED WIT

WATTS.—I see that a Japanese has invented an apparatus for filling an enemy's eyes with dust at a distance of several feet. I wonder how it works?

Petts.—Something like a street sweeper, I suppose.—*Indianapolis Journal.*

Two farmers saw a couple of dudes on the street, when one exclaimed, "Gosh! What funny things we see when we don't have no gun."

THE Angel Gabriel (preparing to sound the last trump).—Silence, now!

Excited Young Man.—Hold on just a second! I've sent a boy for my kodak!—*Chicago Tribune.*

A QUOTATION AMENDED.

He left the woodpile and purloined the pie,
This tramp who scorned all decency and law;
He said—and gaily winked his other eye,
"I came, I conquered, but I never saw."

—New York Sun.

"D'YOU know why the English dude is not wanted in America?"

"No."

"Because the Yankee dude'll do."

OUT OF HIS SIGHT.

He was cantankerous this morning, and was taking it out on his pretty typewriter.

"Everything is in confusion on this desk," he said, testily.

"It always is," she responded, meekly. "You insist that you don't want anything disturbed there."

"Well, I don't want my papers disturbed, but I don't want this sheet of postage stamps left here."

"Where shall I put them?" she inquired, demurely, as she took them up.

"Don't ask so many questions!" he snapped. "Put them any where out of my sight."

"Very well, sir," she cooed as softly as a dove; and, giving them a wipe fore and aft, with her pretty red tongue, she stuck the sheet on his bald head, and walked out to chase a new job.—*Puck.*

"How do you pronounce s-t-i-n-g-y?" asked a teacher of the dunce of the class. The boy replied, "It depends a good deal on whether the word refers to a person or a bee."—*Puck.*

HIAWATHA UP TO DATE.

Thus departed Hiawatha,
To the land of the Dakotas,
To the land of handsome women,
And in ninety days returning,
A divorcelet he brought with him,
To his wife he gave the ha-ha,
Sent her back unto her ma-ma,
In the outskirts of Chicago.

—New York Herald.

A GRAMMARIAN.

Mamma.—Sally, if you had a little spunk you'd stand better in your class. Do you know what spunk is?

Sally (moodily).—I suppose it's the past particle of "spank," mamma.—*Exchange.*

MORE TO SUSTAIN.

Mike O'Finicune.—Phware's me galluses, Mary Ann?

Mary Ann.—Shure an Oi have them on, Mickey, dear. It's the stoile Oi have to kape up, don't yez know?

Mike.—Well, yez hand them over. Oi hev something of more importance than the stoile to kape up.

DR. FOURTHLY.—We are told that heaven is paved with good intentions.

Mr. Citimann.—Yes; but we are told that God is going to tear it up to put in a sewer.

THIS SPEAKS FOR ITSELF

QUINCY, MICH., September 19, 1892.

JNO. P. LOVELL ARMS CO., BOSTON, MASS.

GENTS:—I have ridden a Lovell Diamond No. 1, the number of which is 24, for two seasons, and being unable to break or wear it out, have just sold it for a trifle less than I gave for it.

I now wish to buy a Lovell Diamond Pneumatic, and if there is to be no improvements (I cannot see where you can improve them) for next year, I think I will buy this season.

Please let me know whether you intend improving them, for I shall have nothing but a Lovell Diamond. Very truly,

C. W. MOREY.

Lovell Diamond Cycles : : :

ALWAYS HAVE BEEN AND ALWAYS WILL BE UP TO OUR GUARANTY NAMELY . . . .

$ 85.00 :: :: :: :: :: Best material
95.00 :: :: :: :: :: :: Best workmanship
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If YOU are interested in Gunning, Fishing and Sporting Goods, SEND SIX CENTS IN STAMPS for 100-page ILLUSTRATED CATALOGUE of

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JNO. P. LOVELL ARMS CO.

BOSTON, MASS.

THE HARTFORD SAFETIES

FOR : 1892.

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TO ALL BEARINGS
FITTED WITH
SOLID, CUSHION,
OR
PNEUMATIC TIRES

Manufactured by

THE HARTFORD CYCLE CO.

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2.02$\frac{3}{5}$
Flying Start.

2.05$\frac{3}{5}$
Standing Start.

WORLD'S RECORDS

ON

Columbia Pneumatics.

On Friday, Oct. 7th, at Springfield, W. W. Windle, on a Columbia, lowered the flying start mile to 2.02 3-5, making the half-mile in 59 4-5.

On Saturday, Oct. 8th, the same rider, again on a Columbia, lowered the standing start mile to 2.05 3-5, and the standing start three-fourths mile to 1.34. He also placed the flying start half-mile at 57 4-5.

Thus are the links forged in the chain of evidence that places at the head the

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